E.18

SMALL TACTICAL TERMINAL (STT)

SYSTEM/SEGMENT SPECIFICATION
(FINAL)

CDRL NO. A024/DI-CMAN-80008A

CONTRACT NUMBER F04701-93-C-0007

11 APRIL 1994

PREPARED FOR:
DEPARTMENT OF THE AIR FORCE
SPACE AND MISSILE SYSTEMS CENTER

HARRIS

HARRIS CORPORATION INFORMATION SYSTEMS DIVISION
P.O. BOX 98000. MELBOURNE. FLORIDA 32902-9800 (407) 984-6370

Specification Number SS-DMSP-3037
Code Identification 64755
11 April 1994

SYSTEM SPECIFICATION

FOR THE

METEOROLOGICAL SATELLITE (METSAT) SMALL TACTICAL TERMINAL (STT)

CONTRACT NO. F04701-93-C-0007

CDRL SEQUENCE NO. A024

Prepared for:

Space and Missile Systems Center (SMC/CIIC)
Department of the Air Force

Prepared by:

Harris information Systems Division

Authenticated by _____
(Contracting agency)

Date _____

Approved by _____
(Contractor)

Date _____

1. SCOPE.

1.1 Identification. This system specification sets forth the requirements of the Meteorological Satellite (METSAT) Small Tactical Terminal (SIT). This system is a major element of the DMSP User Segment. This system is identified as the STT and is hereinafter referred to as the system.

1.2 System overview. This system provides tactical weather support to the Army and Air Force. The system consists of lightweight, portable weather terminals that provides an interactive meteorological satellite data analysis capability without reliance on surface communications. The system is configured in basic and enhanced versions. The basic system is upgraded by means of an enhancement kit. The basic configuration of this system ingests, processes, stores, and displays Real-time Data Smooth (RDS) data from the Defense Meteorological Satellite Program (DMSP) satellites: Automatic Picture Transmission (APT) data transmitted from the NOAA Television InfraRed Observations Satellites (TIROS), the Chinese FENG YUN satellites and the Russian METEOR satellites; and Weather Facsimile (WEFAX) data from the Geostationary Meteorological Satellite (GMS), METEOSAT, Geostationary Operational Environmental Satellite (GOES) and GOES-NEXT geostationary satellites. The enhanced configuration of this system, in addition to providing the capabilities of the basic configuration, ingests, processes, stores, and displays encrypted and non-encrypted Real-Time Data (RTD) from the DMSP satellites and High Resolution Picture Transmission (HRPT) data from the NOAA polar orbiting satellites. Both the basic and enhanced systems also provide the capability to interface with the integrated Meteorological System (IMETS), Transportable Automated Weather Distribution System (TAWDS), and Combat Weather System (CWS).

1.3 Document overview. This specification sets forth the performance, design, development, construction, and test requirements of the basic configuration of the system. The requirements for the enhanced configuration of the system are specified in Section 20 of this specification.

1.4 System classifications. This section is not applicable to this specification.

2. APPLICABLE DOCUMENTS.

2.1 Government Documents. The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification see Section 3.8.

SPECIFICATIONS:

Federal

None.

Military

SD-TR-91-212 October 1991	Software Unit level Open System Architecture (ULOSA) Specification
174573 September 1989	Plans Interface Control Document
VD-812A 2 April 1979	DMSP 5D-2 Ether (RF) Interface Specification
IS-VD-821C 28 April 1993	DMSP Data Specification, OLS 5D-2
IS DMSP-853 16 January 1992	DMSP Space Segment to Ground Segment Interface Specification
AWDS-DMSP Interface Spec 5 November 1993	Interface Specification for the DMSP Tactical Terminals to/from Automated Weather Distribution System (AWDS)
CWS-STT Interface Spec 3 February 1994	Interface Specification for the Combat Weather System to/from Small Tactical Terminal

Other Government Agency

IS-2285557 Revision H 20 April 1982	Interface Specification TIROS-N Satellite - Ground System
NSA-TSRD-91-19 4 December 1991	Telecommunications Security Requirements Document for the DMSP STT
NSA-FSRS-91-48 22 November 1991	General Functional Security Requirements for the DMSP STT (S)

NSA-Spec-85-16A 21 December 1988	Qualification, Acceptance and Application of Protective Compounds for Coating Integrated Circuits (S)
NSA-Spec-DS-101D 16 October 1991	Interface Protocols for Electronically Keyable INFOSEC Equipment/System
NSA-Spec-DS-1 OOC 1 November 1991	Data Tagging Standard for Issue of Key
NSA-Spec-87-27 28 September 1987	Draft INFOSEC Application Process Service and Service Protocols
None November 1981	The WEFAX User's Guide

STANDARDS:
Federal

FED-STD-595 15 December 1989	Colors

Military

DoD 5200.28-STD December 1985	Department of Defense Trusted Computer System Evaluation Criteria
MIL-STD-130G 11 October 1988	Identification Markings of US. Military Property
MIL-STD-21 OC 9 January 1987	Climatic Information to Determine Design and Test Requirements for Military Systems and Equipment
MIL-STD-461C 4 August 1986 with Notice 1 1 April 1987	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
MIL-STD-454M with Notice 3 30 October 1991	Standard General Requirements for Electronic Equipment
MIL-ST-D-81 OE 9 February 1990	Environmental Test Methods and Engineering Guidelines
MIL-STD-1275A with Notices 1 & 2 23 April 1981	Characteristics of 28 Volt DC Electrical Systems in Military Vehicles

MIL-STD-1366C 27 February 1992	Transportability Criteria
MIL-STD-1472D 14 March 1989	Human Engineering Design Criteria for Military Systems, Equipment and Facilities

DRAWINGS:

OTHER PUBLICATIONS:

Reports

None 20 July 1989	DMSP Special Sensor Microwave/Imager Calibration/Validation Final Report Volume I Naval Research Laboratory, Washington, D. C.
None 20 May 1991	DMSP Special Sensor Microwave/Imager Calibration/Validation Final Report Volume II Naval Research Laboratory, Washington, D. C.

2.2 Non-Government documents. The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, see Section 3.8.

SPECIFICATIONS:

AE-23386 10 February 1977	Computer Program Product Specification Volume II (Processor-A) Part I Aerojet Electro Systems (SSM/T-1 C5 Spec)
S-DMSP-899 13 April 1991	Draft Software Product Specification for the SSM Water Vapor Profiler Appendix B GenCorp Aerojet (SSM/T-2 C5 Spec)

STANDARDS: N/A

DRAWINGS: N/A

OTHER PUBLICATIONS:

DR32268-020 Rev C February 1991	Special Sensor Microwave/Imager (SSM/I) Data Requirements Document for FNOC
MN32268-020 Rev B March 1991	Special Sensor Microwave/Imager (SSM/I) Program Maintenance Manual for FNOC Volume I
MN32268-020 Rev B February 199 1	Special Sensor Microwave/Imager (SSM/I) Program Maintenance Manual for FNOC Volume II
MN32268-020 Rev B March 1991	Special Sensor Microwave/Imager (SSM/I) Program Maintenance Manual for FNOC Volume III
MN32268-020 Rev B March 1991	Special Sensor Microwave/Imager (SSM/I) Program Maintenance Manual for FNOC Volume IV
MN32268-020 Rev B March 1991	Special Sensor Microwave/Imager (SSM/I) Program Maintenance Manual for FNOC Volume V
MN32268-021 Rev B February 1991	Special Sensor Microwave/Imager (SSM/I) User's Manual (Computer Programs) for FNOC
None March 1980	Meteosat WEFAX Transmissions
None March 1984	The GMS User's Guide
None 1991	Meteor-3 Space System for Hydrometeorological Observation

3. SYSTEM REQUIREMENTS.

3.1 Definition.

3.1.1 System description. This system provides multi-service tactical forces with a transportable satellite data receipt and analysis capability that provides direct data delivery to users without reliance on other means of communications. This system will provide support to Army and Air Force tactical operations. This system will be operated by Air Weather Service (AWS) observers and forecasters.

3.1.2 System segments. This system is an element of the Defense Meteorological Satellite Program user segment as defined in SS-YD-855. Further subdivision of this system into system segments is not required.

3.1.3 Specification tree. The system specification tree is shown in Figure 3.1.3.

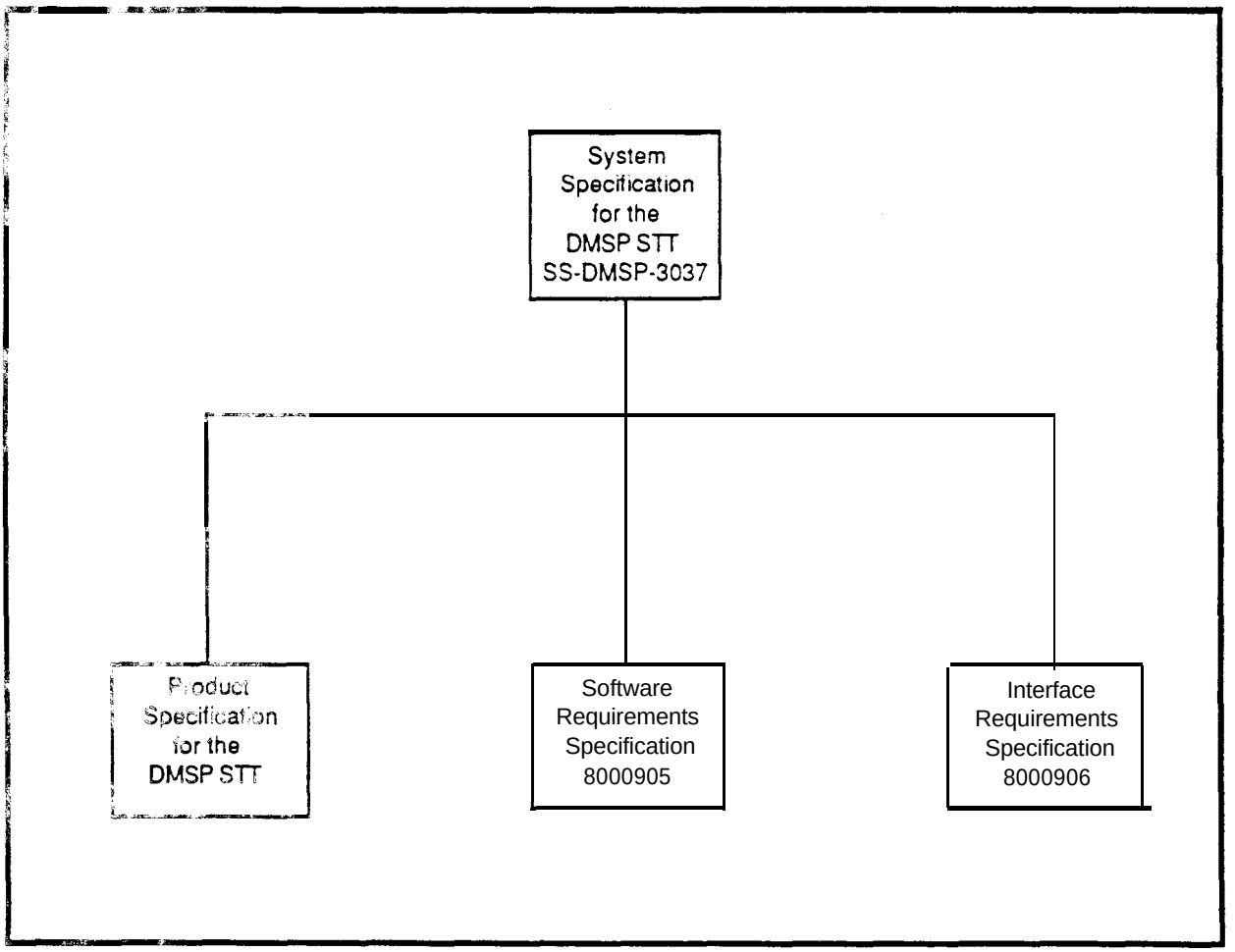

Figure 3.1.3. STT Specification Tree

3.1.4 Top-level system functions.

3.1.4.1 Top-level system functional relationships. The system top level functional flow diagram is shown in Figure 3.1.4.1.

3.1.4.2 Description of system functions. The major system functions are as follows:

a. Receiver/antenna equipment function - This function provides the data reception capabilities for the system such as DMSP, APT/HRPT, WEFAX and GPS data reception. The equipment associated with this function includes antennas and pedestals, antenna controllers, down converters, low noise amplifiers, and receivers.

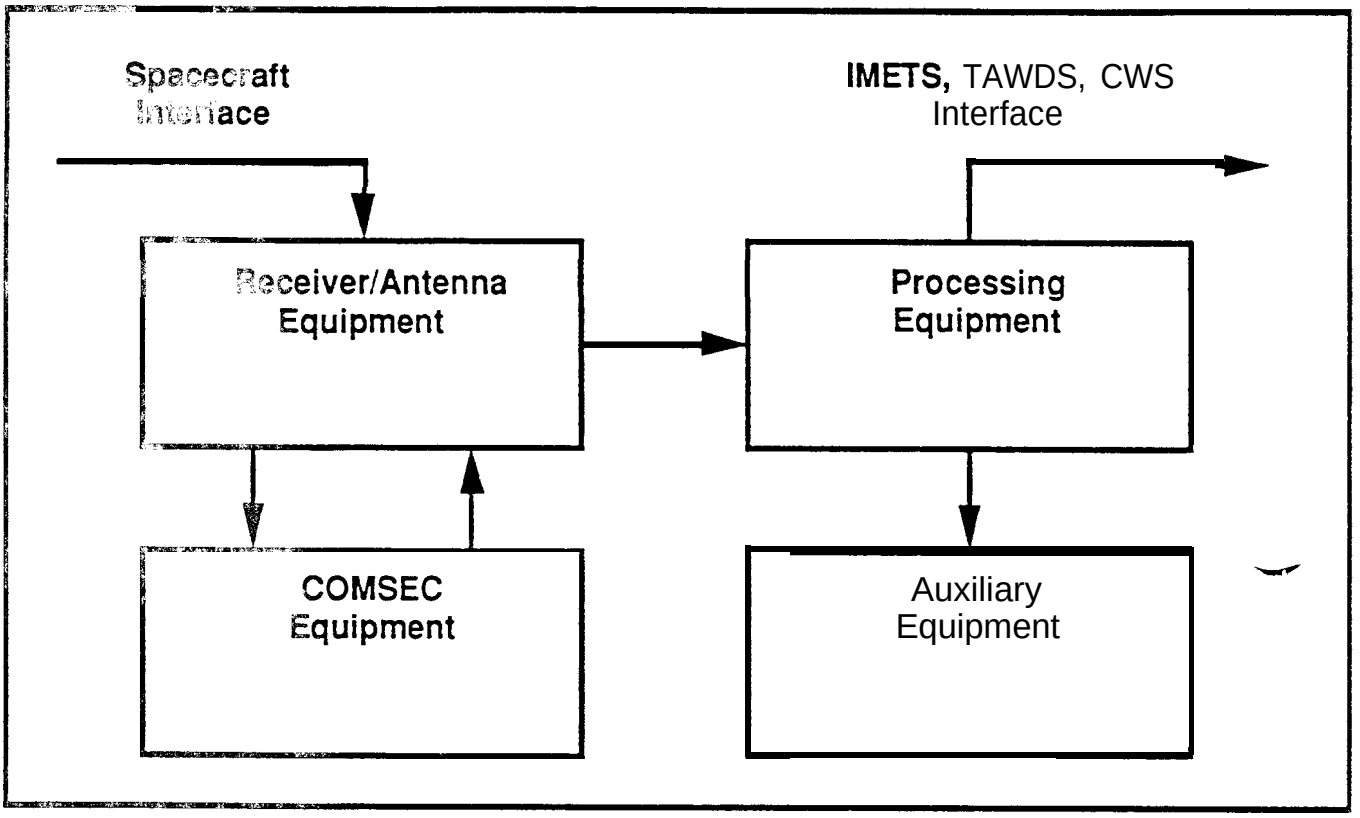

Figure 3.1.4.1 Top Level Functional Flow Diagram

b. COMSEC equipment function - This function provides the DMSP data decryption devices.

c. Processing equipment function - This function provides the computing platform for the system software. The equipment associated with this function includes the central processing unit, memory, data storage devices, data display devices, keyboard, mouse, and input/output devices.

d. Auxiliary equipment function - This function provides the functionality not covered by the other system functions, such as power distribution and equipment housings for transportation. The equipment associated with this function includes power generation equipment, transit cases, and the hardcopy device.

e. System software function - This function provides the mission data processing and control capabilities such as system control, satellite tracking and receiving, data reduction and processing, and display generation. The software associated with this function includes all applications software.

f. Enhancement equipment function - This function provides the capability to upgrade the basic system to the enhanced configuration. The equipment associated with this function includes the storage equipment upgrades, the upgraded display device and the associated transit cases. The enhancement equipment functional requirements are specified in Section 20.

3.1.4.3 Missions. The primary mission of the STT is to provide tactical users, deployed worldwide, with a first-in source of meteorological satellite data in forward areas of conflict. The mission duration is to be 30 consecutive days, 24 hours per day.

3.1.4.4 Threat. No specific threat is expected that will affect the viability or effectiveness of the system.

3.1.5 System states. After initial deployment, the system may be configured as a deployed state or a disassembled state. When in a deployed state, the system is considered operational and can receive DMSP data, APT/HRPT data, WEFAX data, and analyze and display data. When in a disassembled state, the system is packed in transit cases for transportation or storage. Systems deployed with Army units will change states as often as once every three days. Systems deployed with Air Force units will change states about four times a year.

3.1.6 Operational and organizational concepts. The system will be operated by Air Weather Service (AWS) observers and forecasters. The system will be employed at most tactical Air Force and Army units and in support of special operations forces. The STT will be positioned at the highest command echelon in theater. When more than one STT is deployed, they will be located in the following priority: (1) Tactical Forecast Unit of the Joint Task Force (JTF) Headquarters, (2) Air Force component headquarters, (3) US Army Echelon above Corps, (4) special operations command headquarters, and (5) tactical airbases and/or Army units below Corps. If the operation is of sufficient duration to deploy a theater asset, the system will be repositioned to a lower unit as needed.

3.2 Characteristics.

3.2.1 Performance characteristics.

3.2.1.1 Receiver/Antenna function.

3.2.1.1.1 DMSP/HRPT data reception.

a. The system shall accept RDS data from DMSP Block 5D-2 satellites.

b. The system shall be capable of DMSP reception on the following frequencies:

1) 2207.5 MHz,
2) Deleted
3) 2237.5 MHz,
4) 2252.5 MHz,
5) 2267.5 MHz

Signal characteristics are described in IS-YD-812A.

c. Reserved for enhanced capability.

d. Reserved for enhanced capability.

e. The system shall provide a solar alignment capability for the tracking antenna.

3.2.1.1.2 DMSP data processing.

a. The system shall process the DMSP Operational Linescan System (OLS) visible and infrared data for earth curvature correction and perform all necessary calibrations.

b. The system shall earth locate DMSP OLS data and mission sensor data in geodetic latitude and longitude.

c. The system shall generate non-projected images of the received DMSP OLS data. Non-projected images are the data received during the pass that has been earth curvature corrected and earth located.

d. The system shall process mission sensor data (SSM/I, SSM/T-1, and SSM/T-2) into brightness temperature fields. The brightness temperature fields are referred to as Sensor Data Records (SDRs).

e. The system shall generate non-projected images of the received SDRs.

f. The system shall extract text messages (DMDM) from the DMSP data stream for use in updating satellite orbital elements. The DMDM messages are described in specification 174573, the Plans Interface Control Document (ICD).

3.2.1.1.3 Reserved for enhanced capability.

3.2.1.1.4 DMSP/HRPT quicklook.

a. The system shall provide a display of corrected non-projected imagery as the data is being received from the DMSP satellite.

b. The quicklook capability shall be operator selectable.

c. The quicklook capability shall provide a means whereby the operator can select an image channel for display.

3.2.1.1.5 DMSP/HRPT performance.

a. The system shall have a G/T of no less than -4.1 dB/K for DMSP RDS, as measured by the solar flux method.

b Reserved for enhanced capability.

c Reserved for enhanced capability.

The system shall earth locate visible data and infrared data in geodetic latitude and longitude to an accuracy within 5 kilometers (3 sigma value) within the entire swath of data, assuming the ephemeris is accurate to 1 kilometer (3 sigma value).

e. Deleted.

f. No less than 98 percent (3 sigma value) of the visible and infrared data received for a given image when the satellite is greater than 20 degrees above the horizon shall be clear of dropouts and available to the operator for display and analysis.

g No less than 90 percent (3 sigma value) of the mission sensor data received when the satellite is greater than 20 degrees above the horizon shall be clear of dropouts and available to the operator for display and analysis.

h For passes 20 degrees above the horizon, no less than 50 percent (3 sigma value) of the visible, infrared and mission sensor data received between the physical horizon and 20 degrees above the horizon shall be clear of dropouts and available to the operator for display and analysis.

The system shall calculate antenna pointing angles based on a time within ± 2 seconds of Universal Coordinated Time.

3.21.1.6 APT data reception.

a The system shall accept APT data from NOAA polar orbiting satellites.

b. The system shall accept APT data from METEOR polar orbiting satellites.

c. The system shall accept APT data from FENG YUN polar orbiting satellites.

d. The system shall be capable of APT reception on the following frequencies:

1) 137.035 MHz,
2) 137.3 MHz,

3) 137.4 MHz,
4) 137.5 MHz,
5) 137.62 MHz,
6) 137.795 MHz.
7) 137.85 MHz,

3.2.1.1.7 APT data processing.

a. The system shall process APT data into visible and infrared imagery.

b. The system shall earth locate APT data in geodetic latitude and longitude.

c. The system shall generate non-projected images of the received data.

3.2.1.1.8 APT quicklook.

a. The system shall provide a display of non-projected APT imagery as the data is being received from the satellite.

b. The quicklook capability shall be operator selectable.

3.2.1.1.9 APT performance.

a. The system shall have a G/T of no less than -31.5 dB/K for APT, based upon antenna gain, receiving system noise temperature, and published values for noise temperature of the environment.

b. The system shall earth locate NOAA APT data in geodetic latitude and longitude to an accuracy within 10 kilometers (3 sigma value) within the entire swath of data, assuming the ephemeris is accurate to 1 kilometer (3 sigma value).

c. No less than 98 percent (3 sigma value) of the APT data received for a given image when the satellite is greater than 20 degrees above the horizon shall be clear of dropouts and available to the operator for display and analysis.

d. For passes 20 degrees above the horizon, no less than 50 percent (3 sigma value) of the APT data received between the physical horizon and 20 degrees above the horizon shall be clear of dropouts and available to the operator for display and-analysis.

3.2.1.1.10 WEFAX data reception. The system receives WEFAX data from geostationary satellites. The geostationary meteorological satellites include GMS, METEOSAT, GOES, and, when available, GOES-NEXT satellites.

a. The system shall accept WEFAX data from geostationary meteorological satellites.

b. The system shall be capable of WEFAX reception on the following

frequencies:

1) 1691 .O MHz,
2) 1694.5 MHz.

3.2.1.1.11 WEFAX data processing.

a. The system shall generate non-projected images of the received data.

3.2.1.1.12 WEFAX quicklook.

a. The system shall provide a display of WEFAX imagery as the data is being received from the satellite.

b. The quicklook capability shall be operator selectable.

3.2.1.1.13 WEFAX performance.

a. The system shall have a G/T no less than 3.0 dB/K for WEFAX, as measured by the solar flux method.

b. No less than 90 percent (3 sigma value) of the WEFAX data received for a given image when the system is no greater than 81 degrees (earth central angle) from the satellite subpoint shall be clear of dropouts and available to the operator for display and analysis.

3.2.1.1.14 GPS receiver.

a. The system shall provide a GPS receiver, capable of achieving 0.1 second timing accuracy and 1 kilometer position accuracy when at least 3 satellites are in view, for master system timing and system position information.

32.1.2 COMSEC function.

a. The system shall provide a decryption device for the RDS data stream.

b. The RDS decryption device shall:

1) utilize the KG-46 algorithm
2) accommodate no less than 4 keys
3) read in keys electronically from an external data transfer device

c. The RDS decryption device shall be an externally accessible module that can be removed with the use of tools when:

1) the system is in a disassembled state, and
2) the system is in a deployed state.

d. The system shall select keys in the RDS decryption device without operator intervention for scheduled satellites.

e. The system shall bypass the RDS decryption device without operator intervention for selected satellites.

f. The RDS decryption device shall conform to the following:

1) NSA-TSRD-91-19,
2) NSA-FSRS-91-48,
3) NSA Specification 85-I 6A,
4) NSA Specification DS-101 D,
5) NSA Specification DS-1 OOC, and
6) NSA Specification 87-27.

3.2.1.3 Data processing function.

3.2.1.3.1 DMSP/HRPT projection processing.

a. The system shall be capable of generating projected images of the received OLS data in either Mercator or Polar Stereographic representation.

b. The system shall be capable of generating projected images of the received SDRs in either Mercator or Polar Stereographic representation.

c. Reserved for enhanced capability.

d. The operator shall be able to select, during system initialization, whether Mercator, Polar Stereographic, or no projected images shall be generated.

e. It shall be possible to generate projected images from the entire decimated image, or from smaller undecimated portions of the image.

f. Projection shall be to the STT Area of Operations.

3.2.1.3.2 APT projection processing.

a. The system shall be capable of generating projected images of the received NOAA APT data in Mercator or Polar Stereographic representation.

b. The operator shall be able to select, during system initialization, whether Mercator, Polar Stereographic, or no projected images shall be generated.

c. Projection shall be to the STT Area of Operations.

3.2.1.3.3 Data storage.

a. The system shall store the following data items without operator intervention:

1) projected images
2) non-projected images
3) Sensor Data Records (SDRs)
4) Environmental Data Records (EDRs)
5) text messages

d. The **system** shall maintain the data items by the following data types:

1) DMSP data
2) APT data
3) WEFAX data
4) Reserved for enhanced capability.

c. Reserved for enhanced capability.

d The **system** shall allow the operator to reallocate capacities between data types.

e The system shall provide storage for DMSP data allocated as follows:

1)	Projected and non-projected data	22 MBytes
2)	Sensor Data Records	8 MBytes
3)	Environmental Data Records	16 MBytes
4)	Text messages	.01 MBytes

f **Reserved** for enhanced capability.

g. The system shall provide storage for APT data allocated as follows

1)	Projected and non-projected data	16 MBytes

h. **The** system shall provide storage for WEFAX data allocated as follows

1)	WEFAX images	24 MBytes

The **system** shall, upon operator request, archive EDR data files and the associated meteorological displays to an area on internal mass storage which is not automatically purged.

j. Reserved for enhanced capability.

k. The system shall, upon operator request, restore to main memory any **EDR** data files and the associated meteorological displays archived on internal mass storage.

Reserved for enhanced capability.

m. **The system shall, upon operator request, archive any images or SDRs to an area on internal mass storage which is not automatically purged.**

n. Reserved for enhanced capability.

o. The system shall, upon operator request, restore to main memory any image or SDR archived on internal mass storage.

p. Reserved for enhanced capability.

q. The system shall store the following data items as defined by the operator:

1) External formatted products
2) Rnternal formatted products
3) Enhancement tables

r. The system shall provide a nominal storage for user defined products, including automatically generated products, as follows:

1)	External formatted products	20 MB
2)	Internal formatted products	55.5 MB
3)	Enhancement tables	0.5 MB

s. The system shall allow the operator to reallocate capacities to operator defined data items.

t. The system shall prevent the operator defined allocations from impacting operations.

u. The system shall warn the operator when the defined allocations are in jeopardy.

3.2.1 3.4 Autonomous operations.

3.2.1.3.4.1 Orbital pass scheduling

a. The system shall generate satellite pass schedules for:

1) DMSP Satellites
2) NOAA Satellites
3) METEOR Satellites
4) FENG YUN Satellites

b. Satellite pass schedules shall be generated based on satellite positions calculated using the Simplified General Perturbations (SGP) ephemeris model, and a minimum elevation angle.

c. The system shall utilize information contained in the NORAD two card element set to initialize the SGP model.

d. The system shall accept NORAD two card element sets entered by the operator.

e. The system shall accept the equivalent of the NORAD two card element sets obtained from the DMSP DMDM Special Message 8 data without operator intervention.

f. The system shall use the NORAD two card element set equivalents obtained from the DMSP DMDM Special Message 8 data to update satellite configuration files.

g. The system shall be capable of displaying the NORAD two card element set equivalents obtained from the DMSP DMDM Special Message 8 data.

h. System timing and system position information shall be based on timing and position information obtained from the Global Positioning System (GPS).

i. The system shall identify satellite acquisition conflicts to the operator.

The system shall allow the operator to resolve satellite acquisition conflicts by selecting between the conflicting satellite passes.

k. The system shall allow the operator to modify the satellite pass schedule.

l. The system shall allow the operator to set the minimum satellite acquisition angle.

m. The system shall acquire data according to the schedule without operator intervention.

n. Reserved for enhanced capability.

o. Reserved for enhanced capability.

3.2.1.3.4.2 Geostationary reception scheduling

a. The system shall allow the operator to schedule data reception from geostationary satellites.

b. After scheduling and antenna alignment, the system shall accept WEFAX data from geostationary meteorological satellites without any further operator intervention.

c. The system shall provide pointing angles to geostationary satellites based on:

1) NORAD two card element sets, or equivalent
2) the SGP model
3) time and position information from GPS

d. The system shall accept NORAD two card element sets entered by the operator.

e. **The** system shall identify satellite acquisition conflicts to the operator.

f. The system shall allow the operator to resolve satellite acquisition conflicts by selecting between the conflicting satellite transmissions.

3.2.1.3.4.3 Shutdown

a. The system shall gracefully shut down by closing all open system files and logging out all users in the event of an interruption of power.

b. As part of the graceful shutdown, the system shall retain data obtained from completed passes. The system is not required to retain data from passes interrupted by the loss of power.

c. The system shall retain system configuration data including:

1) satellite schedules, including conflict resolution
2) setup data, including default projection
3) satellite configuration, including frequency and NORAD two-card element sets or equivalent
4) product definition for automatic product generation

d. The system shall allow the operator to command a shutdown.

3.2.1.3.4.4 System message generation.

a. The system shall generate error messages, diagnostic messages, and alarm messages on-line to facilitate fault isolation and identification by organizational level maintainers.

b. The system shall generate off-line error and diagnostic messages, such as unexplained application error messages, for logging onto the system files for faults which require isolation and identification by organizational level maintainers but can be addressed off-line and do not degrade system performance.

c. With the exception of diagnostics procedures for use following an abnormal condition, processor message and advisory formats shall be constructed such that additional interpretation by the operator (e.g., table lookups and references to documentation) are not required.

d. Displayed error messages shall include the following information:

1) a textual description of the error condition,
2) required operator actions, where applicable,
3) access to diagnostics procedures, where applicable.

e. **Logged error messages shall include the following information:**

1) **the time the error was detected,**

2) a textual description of the error condition,
3) required operator actions, where applicable,
4) **access** to diagnostics procedures, where applicable.

3.2.1.3.5 Data analysis. For the purposes of this specification, an image consists of the visual or infrared data received from 20° elevation to 20° elevation for a polar orbiting satellite pass. The image can be either projected or non-projected. The system provides an overlay capability. For the requirements of this paragraph, overlays are defined as earth-locatable graphical entities.

a. The system shall provide the data analysis capabilities listed in Table 3.2.1 3.5-l. See section 6.3.2 for tool definitions.

b. The data analysis capabilities shall operate on the data items as shown in Table 3.2.1.3.5-2. An x in the table indicates that the analysis tool will operate on the indicated data item. Note that four entries in Table 32.1.3.5-l (Text Editor, Orbital Trajectory, Quick EDR, and X-Y Shift) are not Jata item specific, and do not appear in Table 3.2.1.3.5-2.

c. The system shall display an animated loop of 16 images obtained from WEFAX data.

d. The rate of animation for images obtained from WEFAX data shall be selectable from 1 to 10 images per second.

e. The animation loop for images obtained from WEFAX data shall run in the forward or backward directions, based on operator selection.

f. The system shall utilize worldwide 1000 mb height field climatology data as part of the Environmental Data Record (EDR) generation capability.

g. The system shall display an animated loop of 16 upper air charts.

h. The rate of animation shall be selectable from 1 to 10 upper air charts per second.

i. The upper air chart animation loop shall run in the forward or backward directions, based on operator selection.

a.	Text Editor	p.	Overlay
b.	Orbital Trajectory	q.	Zoom/Pan/Scroll
c.	Quick EDR	r.	Cursor Interrogation
d.	Contouring	s.	Annotate/Draw
e.	Raster Imaging	t.	Distance Between Points
f.	ASCII Text File	u.	Toggle
g.	Wind Barbs	v.	Histogram Equalization
h.	Streamlines	w.	Color Lookup tables
i.	Map backgrounds	x.	Reserved
j.	False Color	y.	Thresholding
k.	Update Data	z.	Cursor Positioning
l.	High/Low Pass Filters	aa.	Skew-T Log-P
m.	Animation	bb.	Edit Skew-T Log-P
n.	EDR to Met Display	cc.	Change Projection
o.	Units Conversion	dd.	X-Y Shift for Overlays

Table 3.2.1.3.5-1. STT Analysis Tools

3.2.1.3.6 Product generation. For the purposes of this specification, the tropical Mercator projection is a secant Mercator projection that intersects the earth at standard latitudes of 22.5° North and 22.5° South. The polar stereographic projection is a secant polar stereographic projection that intersects the earth at standard latitudes of 60.0° North or 60.0° South, as applicable. A meteorological product consists of images or meteorological products as well as any associated overlays.

a. The system shall provide the following overlays:

1) worldwide geopolitical boundaries to the state or province level, as applicable,
2) worldwide land and sea boundaries,
3) worldwide lakes and rivers,
4) and latitude-longitude lines with labels.

b. The boundary overlays and lakes and rivers overlays shall be derived from World Data Bank II (WDBII).

c. For a given image and the selected overlays, the system shall provide the capability to merge the overlays into the image.

d. The system shall generate the Environmental Data Records (EDRs) shown in Table 3.2.1.3.5-2.

e. The system shall generate the EDRs from projected SDRs.

f. The system shall generate the EDRs from non-projected SDRs.

g. For a given meteorological display and the selected overlays, the system shall provide the capability to merge the overlays into the meteorological display.

DATA ITEM \ ANALYSIS TOOL	Contouring	Raster Imaging	ASCII Text File	Wind Barbs	Streamlines	Map Backgrounds	False Color	Update Data	Hi/LO Pass Filters	Animation	EDR to Met Display	Units Conversion	Overlay	Zoom/Pan/Scroll	Cursor Interrogate	Annotate/Draw	Distance 'tween Points	Toggle	Histogram Equalization	Color Lookup Tables	Thresholding	Cursor Positioning	Skew-T Log-P	Edit Skew-T Log-P	Change Projection
DMSP OLS VIS & IR		X				X	X	X	X				X	X	X	X	X	X	X	X		X			X
NOAA APT VIS & IR		X				X	X	X	X				X	X	X	X	X	X	X	X		X			X
WEFAX VIS & IR		X								X				X		X		X	X	X					
DMSP SDRs																									
SSM/I	X	X				X	X		X				X	X	X	X	X		X	X		X			X
SSM/T-1	X	X				X	X		X				X	X	X	X	X		X	X		X			X
SSM/T-2	X	X				X	X		X				X	X	X	X	X	X	X	X		X			X
EDRs - SSM/T-2																									
Vertical WV Profile								X				X											X	X	
Spec & Rel Humidity	X		X			X				X	X		X	X		X	X	X			X	X			X
Dew Point Grids	X		X			X		X		X	X	X	X	X		X	X	X			X	X			X
Air Mass Type	X		X			X		X			X		X	X		X	X	X			X	X			X
DP Depression Grids	X		X			X				X	X	X	X	X		X	X	X			X	X			X
WV Mass 'tween Lvls	X					X		X		X	X	X	X	X		X	X	X							X
EDRs - SSM/T-1																									
Vert Pressure Profile (Soundings)								X															X		
Ht of Constant Pressure Sfc	X		X			X				X	X		X	X		X	X	X			X	X			X
Gridded Temp at Pressure Lvls	X		X			x				X	X	X	X	X		X	X	X			X	X			X
Geostrophic Wnds at Pressure Lvls			X	X	X	x				X	X	X	X	X		X	X	X			X	X	X	X	X
Gridded Thickness 'tween Layers	X		X			X				X	X		X	X		X	X	X			X	X			X
Vertical Temp Profile (Soundings)								X				X											X	X	
Thermal Winds 'tween Layers				X	X	X				X	X	X	X	X		X	X	X			X	X			X
Tropopause Temp	X					X		X		X	X	X	X	X		X	X	X			X	X	X	X	X
Tropopause Pressure	X					X		X		X	X		X	X							X	X	X	X	X
EDRs - SSM/I																									
Tot Precip Water Fields	X		X			X		X			X		X	X	X	X	X	X			X	X			X
Sfc Windspeed	X		X			X		X			X	X	X	X	X	X	X	X			X	X			X
Sfc Type			X			X		X			X		X	X	X	X	X	X				X			X
Sfc Temp	X		X			X		X			X	X	X	X	X	X	X	X			X	X			X
Cloud Liquid Water	X		X			X		X			X		X	X	X	X	X	X			X	X			X
Soil Moisture	X		X			X		X			X		X	X	X	X	X	X			X	X			X
Rain Rate	X		X			X		X			X	X	X	X	X	X	X	X			X	X			X
Ice Concentration	X		X			X		X			X		X	X	X	X	X	X			X	X			X
Snow Edge	X		X			X		X			X		X	X		X	X	X				X			X
Snow Depth	X		X			X		X			X	X	X	X	X	X	X	X			X	X			X
Ice Age	X		X			X		X			X		X	X	X	X	X	X			X	X			X
Ice Edge	X		X			X		X			X		X	X		X	X	X				X			X

Table 3.2.1.3.5-2. Application of Analysis Tools to Data **Items**

3.2.1.3.6.1 Automatic product generation.

a. The system shall provide a means whereby the operator may specify reprojection to the default projection as a product to be automatically generated.

b. The system shall provide a means whereby the operator may specify a particular DMSP EDR as a product to be automatically generated.

c. Deleted.

d. The system shall execute the product specifications upon data arrival without operator intervention.

3.2.1.3.7 Product display.

a. The system shall display a product in accordance with the product display capabilities shown in Table 3.2.1.3.5-2.

b. The system shall display any operator selected combination of overlays of geopolitical boundaries, land-sea boundaries, and latitude-longitude lines on any earth located image.

c. The system shall display any operator selected combination of overlays of geoplitical boundaries, land-sea boundaries, and latitude-longitude lines on any meteorological display.

d. The system shall display an entire received image; this may be in a decimated form.

e. The system shall allow the operator to zoom on a displayed image.

f. The system shall allow the operator to pan and scroll over a displayed image.

g. A number of colors, not to exceed 32 colors, shall be reserved for non-image displays such as overlays, borders, and text.

h. The system shall simultaneously display two images in different windows such that both images maintain their unique color enhancements.

3.2.1.3.7.1 Softcopy display device.

a. The system shall include a color softcopy display device.

b. The softcopy display device shall have a resolution no less than 640 X 480 pixels.

c. The minimum display viewing area for the softcopy display device shall be no less than 23.0 centimeters (9 inches) diagonally.

d. The softcopy display device shall have a minimum of 256 level (8 bit) color/gray scale.

3.2.1.3.8 Performance. For the performance requirements of this paragraph, a polar orbiter pass completes when the antenna elevation angle necessary to track the satellite transitions from a value greater or equal to 20° to a value less than 20°.

a. The system shall be able to simultaneously display a non-projected visible or infrared image from the tracking antenna, a non-projected visible or infrared image from the APT antenna and a WEFAX image as the data is being received.

b. The system shall be capable of displaying a polar orbiter non-projected visible, infrared or SSM/I SDR image from a 20° to 20° above the horizon pass in no greater than two minutes from the completion of the pass.

c. The system shall be capable of displaying a polar orbiter projected visible, infrared or SSM/I SDR image from a 20° to 20° above the horizon pass in no greater than two minutes from the completion of the pass.

d. The system shall set up an animated loop of 16 images obtained from WEFAX data in no greater than one minute from the operator request.

e. The system shall generate a hardcopy in no greater than five minutes from the operator request for the following:

1) a stored polar orbiter image
2) a stored polar orbiter meteorological display
3) an image obtained from WEFAX data

f. The system shall produce a hardcopy of the currently displayed screen no greater than one minute from the operator request.

g. The system shall allow the operator to execute another command in less than three seconds from the time the operator requests the print command.

h. The system shall generate an EDR from an SDR projected image and convert it to a meteorological display in no greater than one minute from the operator request.

i. The system shall generate an EDR from an SDR non-projected image and convert it to a meteorological display in no greater than one minute from the operator request.

j. The system shall set up an animated loop of 16 upper air charts in no greater than one minute.

k. The system shall generate EDRs using the same algorithms as used by AFGWC and FNOC, as documented in the SSM/I calibration/validation report, the SSM/I data requirements document for FNOC, the SSM/I

program maintenance manual for FNOC, the SSM/I user's manual (computer programs) for FNOC, the SSM/T-1 C5 specification, and the SSM/T-2 C5 specification.

l. The system shall display animated loops at rates between 1 and 10 images per second upon operator request.

3.2.1.3.9 Exchangeable media. The system includes exchangeable media for the purpose of loading software and data onto the system.

a. The system shall include a 3.5 inch floppy disk drive.

b. Reserved for enhanced capability.

3.2.1.4 Auxiliary Equipment Function.

3.2.1.4.1 Hardcopy device. There is no maximum length for a hardcopy produced by the hardcopy device.

a. The system shall include a hardcopy device.

b. The resolution of the hardcopy device shall be no less than 79 dots per centimeter.

c. The hardcopy device shall support no less than 16 gray scale levels.

d. Hardcopies produced by the hardcopy device shall have a width no less than 21.5 centimeters.

e. Hardcopies produced by the hardcopy device shall have left and right margins no greater than 3.8 centimeters.

3.2.1.4.1.1 Hardcopy product generation.

a. The system shall generate hardcopy of:

1) a stored polar orbiter image
2) a stored polar orbiter meteorological display
3) an image obtained from WEFAX data
4) the currently displayed screen

3.2.1.5 Endurance.

a. The system shall support a mission duration of 30 consecutive days, 24 hours per day.

3.2.2 System capability relationships.

3.2.2.1 State changes. The transition between the deployed state and the disassembled state is a physical activity. The number of personnel required for the transitions is specified in 3.6.1.2.

a. The following transitions shall require no greater than 45 minutes:

1) from the disassembled state to the deployed state. This excludes the time for temperature of the sheltered equipment to stabilize within the operational range.

2) from the deployed state to the disassembled state

b. The transition from the deployed state to the disassembled state shall require no greater than 45 minutes for personnel wearing chemical suits.

3.2.2.2 Startup types.

a. The system shall provide a cold start, which is an initial setup. This will be used when the system is taken out of storage, or moved between theaters. The following actions shall be performed at cold start:

1) Delete all non-archived images.

2) Delete all products.

3) Delete satellite pass schedules.

4) Retain user enhancement tables.

5) Retain product definitions.

6) Retain satellite configuration files.

b. The system shall provide a warm start, where it starts in an already configured state, and rebuilds the scheduling tables. This will be used when the system is moved within theater.

c. The system shall provide a hot start, where it starts in an already configured state. This will be used when there is a temporary loss of power, or when the system is turned off and restarted.

d. Startup type shall be selectable by the operator at time of startup.

3.2.2.3 Concurrent operations.

a. The system shall provide the DMSP or NOAA HRPT data reception capabilities specified in 3.2.1 .1.1, 3.2.1.1.2 and 3.2.1 .1.3 concurrent with the data analysis capabilities of Table 3.2.1.3.5-1 (except for animation performance) and the display of images and EDRs.

b. The system shall provide APT data reception capabilities specified in 3.2.1 .1.6 and 3.2.1 .1.7 concurrent with the data analysis capabilities of Table 3.2.1.3.5-1 (except for animation performance) and the display of images and EDRs.

c. The system shall provide the WEFAX data reception capabilities specified in 3.2.1.1.10 and 3.2.1.1.11 concurrent with the data analysis capabilities of Table 3.2.1.3.5-1 (except for animation performance) and the display of images and EDRs.

d. The system shall be capable of performing items a, b, and c above simultaneously.

3.2.3 External interface requirements.

3.2.3.1 External interface with spacecraft systems.

3.2.3.1.1 DMSP interface. The system interfaces to the DMSP Block 5D-2 spacecraft to receive OLS visible and infrared data as well as special sensor data and DMDM messages.

a. The interface to the DMSP Block 5D-2 spacecraft shall be in accordance with IS-DMSP-853 and IS-YD-812A.

b. The RDS data format shall be in accordance with IS-YD-821C and specification 174573 (the Plans ICD).

3.2.3.1.2 APT data interface. The system interfaces to the NOAA TIROS-N, FENG YUN, and the METEOR satellites for the receipt of APT data.

a. The NOAA TIROS-N APT data interface shall be in accordance with IS-2285557.

b. The FENG YUN APT data interface shall be in accordance with IS-2285557.

c. **The METEOR data interface shall be in accordance with the document** "Meteor-3 Space System for Hydrometeorological Observation".

3.2.3.1.3 WEFAX data interface. The system interfaces to the GOES, METEOSAT, GMS, and, when available, GOES-NEXT geostationary satellites for the receipt of WEFAX data.

a. The GOES and GOES-NEXT WEFAX data interface shall be in accordance with "The WEFAX User's Guide".

b. The METEOSAT WEFAX data interface shall be in accordance with the document "METEOSAT WEFAX Transmissions".

c. The GMS WEFAX data interface shall be in accordance with "The GMS User's Guide".

3.2.3.1.4 Reserved for enhanced capability.

3.2.3.2 Description of external interface with ground systems. The system interfaces to external systems for the purpose of transferring data.

a. The system shall provide one Ethernet port for interface with IMETS, TAWDS, and CWS.

3.2.3.2.1 Weather product interface. The system supports the transfer of weather product data to external systems. Weather product data consists of Uniform Gridded Data Field (UGDF) products and raster scan products.

a. The system shall transfer Uniform Gridded Data Field (UGDF) products to external systems that comply with the AWDS-DMSP Interface Specification and the CWS-STT Interface Specification.

b. The system shall transfer raster scan products to external systems that comply with the AWDS-DMSP Interface Specification and the CWS-STT interface Specification.

3.2.3.2.2 Computer connectivity standards.

a. The system shall interface to the external systems in accordance with the following sections of ESD-TR-91-212 (ULOSA specification):

1) paragraph 4.1.1.5,
2) subparagraphs a-g of 4.1.2.1,
3) paragraph 4.1.2.5,
4) the “File Transfer”, “Virtual Terminal”, “Mail”, and “Name Service” subparagraphs of 4.2.1.1, 4.2.1.2, 4.2.1.3, 4.2.1.4, 4.2.2, 4.2.2.1, 4.2.2.2, 4.2.2.3, 4.2.4, 4.2.4.1, and 4.2.4.2.

3.2.4 Physical characteristics.

3.2.4.1 Protective coatings. The system will be designed to operate in mildly humid and mildly corrosive atmospheres, such as those in coastal or industrial environments, without destructive corrosion of its parts or assemblies. While in these environments, the system will be operated in rudimentary shelters such as tents, bunkers primitive huts, or lean-tos. Destructive corrosion is defined as any type or degree of corrosion of a device or its associated parts which prevents the system from meeting its specified design parameters.

Elements of the system will be exposed to the effects of prolonged and repeated exposure to salt fog, solar radiation and other environmental effects specified in 3.2.6. These elements include equipment that is located outside of an environmental shelter when the system is in a deployed state. When in a disassembled state, all equipment will be exposed to these environmental effects while packed in transit cases. The color and final film for the system surfaces that are exposed to the weather will be selected by the Government prior to the time of production contract award. The color and final film selected by the Government will match a standard color chip from FED-STD-595.

3.2.4.2 ‘Weight and size properties.

3.2.4.2.1 Size.

a. The sine of the largest elements of the system intended to be transported as a unit shall be less than or equal to 213 centimeters (84 inches) in any dimension.

b. The total volume of the system when packaged in transit cases shall be less than or equal to 3.4 cubic meters (120 cubic feet).

c. While in a deployed state, the system processing, display, and hardcopy equipment shall occupy a total area no greater than 0.9 meters by 1.5 meters (3 by 5 feet).

d. While in the deployed state, the system processing, display, hardcopy equipment, and storage equipment shall be stacked no higher than two meters.

e. The disassembled system shall consist of no greater than 8 transit cases.

3.2.4.2.2 Weight.

a. The total weight of the system is the sum of:

1) prime mission equipment,
2) critical spares,
3) expendables for the hardcopy device sufficient to generate 1500 images over a 30 day mission,
4) 30.5 meters of antenna cabling (if required),
5) power cords,
6) cabling for connecting to external peripherals,
7) manuals,
8) transit cases, and
9) portable generator.

b. The total weight of the system shall be less than or equal to 226 kilograms (500 pounds).

c. Each loaded transit case shall weigh no more than 38 kilograms (84 pounds).

3.2.4.3 Power.

a. The system shall perform within its specified design parameters when using any of the following sources of power:

1) portable generator,
2) standard 120 volt AC, 60 Hz, commercial power,
3) standard 240 volt AC, 50 Hz, commercial power, and
4) 24 volt DC vehicle electrical system.

b. The system shall connect to the vehicle electrical system via a 12 foot power cord using a NATO standard vehicle plug conforming to NSN 2590-0-i -222-7946.

c. The system shall perform within its specified design parameters when connected to DC vehicle power which is within the range of electric power characteristics specified in MIL-STD-1275.

d The system shall include a portable generator.

e. The portable generator shall power the system at 120 volts, 60 Hz.

3.2.4.4 Survivability. This section is not applicable to this specification.

3.2.4.5 Cabling. The system consists of data reception equipment and data processing equipment. The data reception equipment includes, but is not limited to, the antenna. The data reception equipment will be located physically separate from the rest of the system. The antenna cabling is that cabling required to connect the data reception equipment to the rest of the system.

a The antenna cabling for the system shall accommodate no less than 30.5 meters (100 feet) between the data reception equipment and the rest of the system.

3.2.5 System quality factors.

3.2.5.1 Reliability.

a The life cycle for the system shall be 10 years.

b The probability of mission success for a 30 day mission shall be greater than 80 percent. The probability of mission success excludes failures due to GFE power and GFE communications.

c. The mean time between critical failure (MTBCF) shall be no less than 5000 hours. A critical failure is any failure, or combination of failures, that would prevent the system from automatically receiving, processing, storing, and displaying visible and infrared cloud cover imagery for two consecutive hours. The portable generator is auxiliary equipment and is excluded from the MTBCF calculation.

3.2.5.2 Maintainability.

3.2.5.2.1 Mean time to repair.

a. The mean time to repair (MTTR) for the system shall be less than 30 minutes.

b. The maximum corrective maintenance time at the 95th percentile shall be no greater than 1 hour.

3.2.5.2.2 Preventive maintenance.

a. The maximum time for any one preventive maintenance activity shall be

no greater than 15 minutes.

b. The system shall require no greater than 2 hours of preventive maintenance every 30 days.

3.2.5.2.3 Fault isolation. Fault isolation and identification is performed in the field to locate faults to a Line Replaceable Unit (LRU).

a. The system shall provide fault isolation and identification consistent with the skill level of organizational-level maintainers.

b. The fault isolation and identification shall isolate and identify no less than 98 percent of the faults to an LRU without the use of support equipment.

c. Built-in-test/built-in-test-equipment (BIT/BITE) shall be included on the off-the-shelf equipment as necessary to support the isolation and identification of faults to the LRU.

d. BIT/BITE shall be included on the newly developed or modified equipment as necessary to support the isolation and identification of faults to the LRU.

3.26 Environmental conditions. The system will be operated and stored worldwide in all environmental climates, including Arctic, desert, temperate and tropics. The processing, display, printing, and data storage equipment will be operated in a crude structure or vehicle typical for the deployed unit. The antenna and pedestal will be operated in an outdoor environment.

3.2.6.1 Environmental conditions for equipment during storage and transportation (non-operating). The storage and transportation (non-operating) configuration of the system is the disassembled system state.

a. The system shall perform within its specified design parameters after exposure in the storage and transportation (non-operating) configuration to any combination of the following storage and transportation environmental conditions:

1) low pressures equivalent to altitudes no greater than 4570 meters (15,000 feet) above sea level,

2) ambient temperatures no less than -40° C and no greater than 60° C representing the combined effects of high temperature and solar radiation on closed containers,

3) relative humidity no less than 5 percent and no greater than 95 percent, including condensation due to temperature changes

4) salt fog as simulated by MIL-STD-810E, Method 509.3,

3.2.6.2 Shock and vibration. The shock and vibration requirements apply to a system in a disassembled state. In a disassembled state, the system is packaged in

3) ambient temperatures no greater than 60° C, including the combined effects of high temperature and solar radiation for up to four hours per day for equipment enclosed in unshaded, unventilated housings at sea level, where the high temperature is reduced by 1.9° C for each 1000 feet of altitude above sea level and the combined effects of solar radiation and temperature are as shown in MIL-STD-210C, Table I,

4) relative humidity, including condensation due to temperature changes, of O-l 00%,

5) steady wind conditions of no greater than 13.4 meters per second (30 miles per hour),

6) wind gust conditions no greater than 22.4 meters per second (50 miles per hour),

7) ice/snow build up of 0.6 centimeters (0.25 inch),

8) following, but not including, rainfall of 10 centimeters per hour,

9) blowing sand and dust simulated in MIL-STD-810E, Method 510.3,

10) salt fog as simulated by MIL-STD-810E, Method 509.3,

11) unprepared, clear sites with ground slope no greater than 10 degrees.

b. The equipment operating outside the shelter shall not be damaged when exposed to the following winds:

1) steady wind conditions of no greater than 25 meters per second (56 miles per hour),

2) wind gust conditions no greater than 33.5 meters per second (75 miles per hour),

3.2.7 Transportability. The transportability requirements apply when the system is in a disassembled state, loaded into transit cases.

a. Handling tie-downs and sling points shall be incorporated in the design of the disassembled system as needed to optimize transportability and complement maintenance and warehousing requirements.

b. Electrostatic sensitive items shall be stored and transported in sealed packages using anti-static wrapping material.

c. The disassembled system shall be suitable for shipment by tactical military land vehicles.

d. The disassembled system shall be suitable for shipment by C-130 aircraft, C-141 aircraft, or C5-A aircraft using the 463L cargo system.

e. MIL-STD-1366C will be used as a guide for the selection of NDI and design of the transport configuration of the system.

3.2.8 Flexibility and expansion. The system will have hardware and software that is modular and expandable in order to accomplish changes to the DMSP satellite data format and content.

3.3 Design and construction.

3.3.1 Materials.

a. The system shall maximize the use of NDI for hardware to the extent that such items support compliance of the system with requirements specified in other sections of this document.

3.3.2 Electromagnetic radiation.

a. The system shall comply with the electromagnetic compatibility requirements in MIL-STD-461C, Part 3, paragraphs 3, 3.1, 3.2, 3.2.1, 3.2.2, 4, 4.1, 4.2, 4.2.1, 5, 5.1, 5.2, 6, 6.1, 6.2, 7, 7.1, 7.2, 8, 8.1, 8.2, 10, 10.1, 10.2, 11, 11.1, 11.2, 14, 14.1, 14.2, 14.2.1, 14.2.2, 16, 16.1, 16.2, 16.2.1, 16.2.2, 17, 17.1, and 17.2.

b. The DMSP/HRPT, APT, and WEFAX receiving systems shall have a minimum attenuation of 50 dB in the following stopbands:

1) 600 MHz to 1400 MHz
2) 2700 MHz to 4000 MHz.

The system frequency rejection capability is intended to make the system resistant to electromagnetic interference such as emanations from other communications sources, and radars.

3.3.2.1 Red/black interface control. This section is not applicable to this specification.

3.3.2.2 TEMPEST requirements. This section is not applicable to this specification.

3.3.3 Nameplates and product marking.

a. Except for the marking of non-developmental items, the STT shall comply with the product marking requirements of MIL-STD-130G.

3.34 Workmanship.

a. MIL-STD-454, Requirement 9, will be used as a guide to establish acceptable workmanship criteria for the equipment.

3.3.5 Interchangeability.

a. The system shall have a modular hardware and software design to facilitate manufacturing, maintenance and up-grades over its life cycle.

b. The determination of replaceable equipment module level (see 3.5.1.1) will include tradeoffs between the MTTR, weight of critical spares, and design changes required to accommodate planned upgrades.

3.3.6 Safety.

a. MIL-STD-454, Requirement 1, will be used as a guide to establish safety design criteria for the system.

3.3.7 Human engineering. MIL-STD-1472D will be used as a guide for human engineering for the system. The human-machine interface (HMI) is to be intuitive and promote maximum useability and responsiveness. The operator interface shall:

a. provide feedback for all user inputs,

b. provide guidance to the user when needed or requested,

c. be designed for consistency,

d. provide flexibility for the user,

e. accommodate errors and provide easy to use error correction mechanisms,

f. require minimal effort to learn and use,

g. easily activate and control the capabilities and functions of the system and display, and

h. be usable by an operator in a chemical suit.

3.3.8 Nuclear control. The system shall have no nuclear components.

3.3.9 System security..

3.3.9.1 Security classification.

a. The system shall meet the requirements for a Division C Class C2 Trusted Computer System, as defined in DoD 5200.28~STD.

b. The system hardware, software, and data shall be unclassified except as described in paragraph 3.3.9.2.

3.3.9.2 COMSEC equipment classification. The COMSEC equipment is used for the DMSP data streams. The COMSEC device for the RTD data stream is a KG-44.

d. initial provisioning for spares, repair parts, and special supplies shall include support for those levels of maintenance identified in the support concept.

e. The system shall operate for 30 days without the need for resupply of bulk consumables.

3.5.3 Support facilities.

a. Quantitative requirements developed through the LSA process shall specify the need for any peculiar facility requirements.

3.5.4 Support and test equipment.

a. Organization-level maintenance shall require no support equipment other than common hand tools.

b. The need for peculiar support equipment for depot repair shall be minimized and identified through the SERD process.

3.6 Personnel and training.

3.6.1 Personnel.

3.6.1.1 Skill levels.

a. The system shall be capable of operation by personnel with Air Force Specialty Code (AFSC) 15WX or 1W0X1.

b. The system shall support organizational level maintenance by personnel with AFSC 1 W0X1.

3.6.1.2 Personnel requirements.

a. The system is to be operated 24 hours per day in a 3-shift operation. To reduce the number of personnel required to operate the system, the number of personnel per shift is to be minimal. The system shall meet all deployed state requirements while being operated by no greater than one person.

b. The system shall meet the state change requirements specified in 3.2.2.1 with no greater than two persons.

c. The disassembled system shall require no more than 2 persons for transportation, excluding transport personnel.

3.6.2 Computer based instruction.

a. Each system delivered shall have computer based instruction provided either resident on the system or loadable onto the system.

b. The computer based information shall include a tutorial to operations personnel on the following:

1) set-up/tear-down procedures
2) operations
3) field maintenance
4) packaging requirements
5) transportation requirements

3.7 **Characteristics** of subordinate elements. Reserved.

3.8 **Precedence.**

3.8.1 Conflicts. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered the superseding requirements, unless the conflict involves external interface requirements of the system. In the event of a conflict involving the external interface requirements of the system, such as a conflict with equipment external to the system being specified, or in the event of any other unresolved conflict, such as a conflict with government furnished property, the contracting officer shall be notified, and the order of precedence shall be as directed by the contracting officer.

3.8.2 Requirement weighting factors. Reserved.

3.9 Qualification. Qualification is required for the system. The contracting officer grants qualification status for the system based on the results of the qualification tests specified in Section 4.

3.19 Standard sample. This section is not applicable to this specification.

3.11 Pre-production sample. This section is not applicable to this specification.

4. QUALITY ASSURANCE PROVISIONS.

4.1 Test and Evaluation (T&E) Program

4.1.1 Test philosophy. The assurance of a successful operation shall be verified and validated by the performance of a T&E program as specified in the following paragraphs. Successful operation shall be defined to include a demonstration of correct performance through a full range of specified operational and environmental tests. The T&E program shall be established and implemented to verify that the STT equipment and computer software to be developed and offered for acceptance conform to the requirements in Section 3 of this specification.

4.1.2 Test scope. The scope of the T&E program for the STT shall be from design and development through operation. Tests and demonstrations of the STT shall be accomplished in accordance with the test plans and procedures submitted to the procuring activity. Except as otherwise noted herein, production testing shall be divided into two phases:

a. STT Formal Qualification Tests (FQTs)
b. STT Production Article Acceptance Test Procedure (ATP)

4.1.3 Test responsibilities. Unless otherwise specified in the contract or purchase order, the contractor shall be responsible for verification of all functional and performance requirements specified herein. Unless otherwise specified, the contractor may use their own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to witness any or all formal tests and inspections performed in support of this specification.

4.1.3.1 contractor responsibilities. In performance of these tests, the contractor shall be responsible for evidence of qualification for contractor-furnished equipment (CFE). The contractor shall verify the applicability, proper installation, and functioning of Government-furnished equipment (GFE) and parts for all contractor tests. The contractor shall be responsible for developing the STT Test Plan and Test Procedures. The contractor shall be responsible for conducting the FQTs and ATPs. During Government-conducted tests, the contractor shall provide advice, assistance, test planning, equipment availability, and logistics support.

4.1.3.2 Government responsibilities. The Government will witness all contractor-conducted formal tests.

4.1.4 Test location. Unless otherwise specified, the FQTs and ATPs will be conducted at the contractor's facilities.

4.2 Verification Methods

The requirements contained in Section 3 of this specification shall be verified by, but not limited to, the verification methods identified in the Verification Cross-Reference Matrix (VCRM) shown in Table 4.2.

4.2.1 Verification Cross-Reference Matrix. The VCRM includes the paragraph number and title of the requirement together with the inspection and verification methods for each step. The annotation “NA” is used to identify requirements for which there is no intention to conduct formal inspection/verification. The annotation “(R)” is used to identify requirements reserved for the enhanced system. The VCRM shall be used for review of test plans and test procedures and for review of analysis and examination checklists.

4.2.2 Verification Definitions. The following verification method definitions shall be applicable for STT requirement verification:

a. Inspection (I): An observation or examination of the equipment or software to determine conformity with requirements that are neither functional nor qualitative.

b. Analysis (A): A review or study of data, which may use mathematical expressions or models, to show that requirements are met.

c. Demonstration (D): A functional exercise (test) wherein the qualitative requirements are verified by observation at the time of the test.

d. Test (T): A functional exercise wherein quantitative performance requirements are verified via review of data at completion or sometime after completion of the test.

Table 4.2 Verification Cross-Reference Matrix

3.	SYSTEM REQUIREMENTS.	NA				
3.1	Definition.	NA				
3.1.1	System description.	NA				
3.1.2	System segments.	NA				
3.1.3	Specification tree	NA				
3.1.4	Top-level system functions	NA				
3.1.4.1	Top-level system functional relationships.	NA				
3.1.4.2	Description of system functions.	NA				
3.1.4.3	Missions.	NA				
3.1.4.4	Threat.	NA				
3.1.5	System states.	NA				
3.1.6	Operational and organizational concepts.	NA				
3.2	Characteristics.	NA				
3.2.1	Performance characteristics.	NA				
3.2.1.1	Receiver/Antenna function.	NA				
3.2.1.1.1	DMSP/HRPT data reception					
		a			D	
		b			D	
		(R)				
		(R)				
		e			D	
3.2.1.1.2	DMSP data processing					
		a			D	
		b			D	
		c			D	
		d			D	
		e			D	
		f			D	
3.2.1.1.3	Reserved for enhanced capability	(R)				
3.2.1.1.4	DMSP/HRPT quicklook					
		a			D	
		b			D	
		c			D	
3.2.1.1.5	DMSP/HRPT performance					
		a		A		
		(R)				
		(R)				
		d				T
		NA				
		f				T
		g				T
		h				T
		i	I			
3.2.1.1.6	APT data reception					
		a			D	
		b			D	

		c			D	
		d			D	
3.2.1.1.7	APT data processing					
		a			D	
		b			D	
		c			D	
3.2.1.1.8	APT quicklook					
		a			D	
		b			D	
3.2.1.1.9	APT performance					
		a		A		
		b				T
		c				T
		d				T
3.2.1.1.10	WEFAX data reception					
		a			D	
		b			D	
3.2.1.1.11	WEFAX data processing					
		a			D	
3.2.1.1.12	WEFAX quicklook					
		a			D	
		b			D	
3.2.1.1.13	WEFAX performance					
		a		A		
		b		A		
3.2.1.1.14	GPS receiver		I			
3.2.1.2	COMSEC function					
		a	I			
		b			D	
		c	I			
		d			D	
		e			D	
		f	I			
3.2.1.3	Data processing function	NA				
3.2.1.3.1	DMSP/HRPT projection processing					
		a			D	
		b			D	
		(R)				
		d			D	
		e			D	
		f			D	
3.2.1.3.2	APT projection processing					
		a			D	
		b			D	
		c			D	
3.2.1.3.3	Data storage					
		a			D	

		b			D	
		(R)				
		d			D	
		e	I			
		(R)				
		g	I			
		h	I			
		i			D	
		(R)				
		k			D	
		(R)				
		m			D	
		(R)				
		o			D	
		(R)				
		q			D	
		r	I			
		s			D	
		t			D	
		u			D	
3.2.1.3.4	Autonomous operations.	NA				
3.2.1.3.4.1	Orbital pass scheduling					
		a			D	
		b	I			
		c	I			
		d			D	
		e			D	
		f			D	
		g			D	
		h	I			
		i			D	
		j			D	
		k			D	
		l			D	
		m			D	
		(R)				
		(R)				
3.2.1.3.4.2	Geostationary pass scheduling					
		a			D	
		b			D	
		c	I			
		d			D	
		e			D	
		f			D	
3.2.1.3.4.3	Shutdown					
		a			D	
		b			D	

		c			D	
		d			D	
3.2.1.3.4.4	System message generation.					
		a			D	
		b			D	
		c			D	
		d			D	
		e			D	
3.2.1.3.5	Data analysis.					
		a			D	
		b			D	
		c			D	
		d			D	
		e			D	
		f	I			
		g			D	
		h			D	
		i			D	
3.2.1.3.6	Product generation.					
		a			D	
		b	I			
		c			D	
		d			D	
		e			D	
		f			D	
		g			D	
3.2.1.3.6.1	Automatic product generation.					
		a			D	
		b			D	
		NA				
		d			D	
3.2.1.3.7	Product display.					
		a			D	
		b			D	
		c			D	
		d			D	
		e			D	
		f			D	
		g	I			
		h			D	
3.2.1.3.7.1	Softcopy display device.					
		a	I			
		b	I			
		c	I			
		d	I			
3.2.1.3.8	Performance.					
		a			D	

		b				T
		c				T
		d				T
		e				T
		f				T
		g				T
		h				T
		i				T
		j				T
		k	I			
		l				T
3.2.1.3.9	Exchangeable media.					
		a	I			
		(R)				
3.2.1.4	Auxiliary Equipment Function	NA				
3.2.1.4.1	Hardcopy device.					
		a	I			
		b	I			
		c	I			
		d	I			
		e				
3.2.1.4.1.1	Hardcopy product generation.					
		a			D	
3.2.1.5	Endurance.	a		A		
3.2.2	System capability relationships.	NA				
3.2.2.1	State changes					
		a				T
		b				T
3.2.2.2	Startup types					
		a			D	
		b			D	
		c			D	
		d			D	
3.2.2.3	Concurrent operations.					
		a			D	
		b			D	
		c			D	
		d			D	
3.2.3	External interface requirements.	NA				
3.2.3.1	External interface with spacecraft systems.	NA				
3.2.3.1.1	DMSP interface.					
		a			D	
		b			D	
3.2.3.1.2	APT data interface.					
		a			D	
		b			D	
		c			D	

3.2.3.1.3	WEFAX data interface					
		a			D	
		b			D	
		c		A		
3.2.3.1.4	Reserved for enhanced capability	NA				
3.2.3.2	Description of external interface with ground systems.					
		a	I			
3.2.3.2.1	Weather product interface.					
		a			D	
		b			D	
3.2.3.2.2	Computer connectivity standards.					
		a	I			
3.2.4	Physical characteristics.	NA				
3.2.4.1	Protective coatings.	NA				
3.2.4.2	Weight and size properties.	NA				
3.2.4.2.1	Size.					
		a	I			
		b	I			
		c	I			
		d	I			
		e	I			
3.2.4.2.2	Weight.					
		NA				
		b	I			
		c	I			
3.2.4.3	Power.					
		a	I		D	
		b	I			
		c	I			
		d	I			
		e	I			
3.2.4.4	Survivability.	NA				
3.2.4.5	Cabling.					
		a	I			
3.2.5	System quality factors.	NA				
3.2.5.1	Reliability.					
		NA				
		b		A		
		c		A		
3.2.5.2	Maintainability.	NA				
3.2.5.2.1	Mean time to repair.					
		a		A		
		b		A		
3.2.5.2.2	Preventive maintenance.					

3.2.5.2.3	Fault isolation.					
		a		A		
		b		A		
		c	I			
		d	I			
3.2.6	Environmental conditions.	NA				
3.2.6.1	Environmental conditions for equipment during storage and transportatidn (non-operating).					
		a		A		T
3.2.6.2	Shock and vibration.					
		a				T
		b				T
3.2.6.3	Environmental conditions for equipment ooeratina within the shelter.					
		a		A		T
3.2.6.4	Environmental conditions for equipment ooerating outside the shelter.					
		a		A		T
		b		A		
3.2.7	Transportability.					
		NA				
		NA				
		c	I			
		d	I			
		NA				
3.2.8	Flexibility and expansion.	NA				
3.2.8.1	Pre-planned product improvements.	NA				
3.3	Design and construction.	NA				
3.3.1	Materials.					
		NA				
3.3.2	Electromagnetic radiation.					
		a	I			
		b	I			
3.3.2.1	Red/black interface control.	NA				
3.3.2.2	TEMPEST requirements.	NA				
3.3.3	Nameplates and product marking.					
		a	I			
3.3.4	Workmanship					
		NA				
3.3.5	Interchangeability.					
		a	I			
		NA				
3.3.6	Safety.					
		NA				
3.3.7	Human engineering.					
		a			D	
		b			D	

		c			D	
		d			D	
		e			D	
		f			D	
		g			D	
		h			D	
3.3.8	Nuclear control.					
3.3.9	System security.	NA				
3.3.9.1	Security classification.					
		a	I			
		b	I			
3.3.9.2	COMSEC equipment classification.					
		a	I			
3.3.10	Government furnished property usage.					
		NA				
3.3.11	Computer resources.	NA				
3.3.11 .1	Operational computer resources.					
		a	I			
3.3.11 .1.1	Operational computational equipment.					
		a	I			
		b	I			
3.3.11.1.1.1	Main storage (primary memory).					
		a	I			
		b	I			
3.3.11.1.1.2	Peripheral data storage (secondary memory).					
		a	I			
		b	I			
3.3.11.1.2	Operating systems used in operational computers.					
		d	I			
3.3.11.1.3	Operational application software.					
		NA				
3.3.11.1.3.1	Programming language.					
3.4	Documentation.	NA				
3.5	Logistics.	NA				
3.5.1	Support concept.					
		a		A		
3.5.1.1	Organizational maintenance.	NA				
3.5.1.2	Depot maintenance.	NA				
3.5.2	Supply.					
		a		A		

		b		A		
		NA				
		NA				
		e		A		
3.5.3	Support facilities.					
		a		A		
3.5.4	Support and test equipment.					
		a		A		
		b		A		
3.6	Personnel and training.	NA				
3.6.1	Personnel.	NA				
3.6.1.1	Skill levels.					
		a		A		
		b		A		
3.6.1.2	Personnel requirements.					
		a			D	
		b			D	
		c			D	
3.6.2	Computer based instruction.					
		a			D	
		b			D	
3.7	Characteristics of subordinate elements.	NA				
3.8	Precedence.	NA				
3.8.1	Conflicts.	NA				
3.8.2	Requirement weighting factors.	NA				
3.9	Qualification.	NA				
3.10	Standard sample.	NA				
3.11	Pre-production sample.	NA				
10.0	Increasing the Antenna Separation	NA				
10.1	Approach	NA				
10.2	Assumptions	NA				
20.0	Enhanced System Specific Requirements	NA				
20.1.	SCOPE.	NA				
20.1.1	System overview.	NA				
20.1.2	Section overview.	NA				
20.2.	APPLICABLE DOCUMENTS.	NA				
20.3.	SYSTEM REQUIREMENTS.	NA				
20.3.1	Enhanced DMSP/HRPT data reception					
		a			D	
		c			D	
		d			D	
20.3.2	Enhanced HRPT data processing					
		a			D	
		b			D	
		c			D	
20.3.3	Enhanced DMSP/HRPT quicklook					
		a			D	

20.3.4	Enhanced DMSP/HRPT performance					
		b		A		
		c		A		
20.3.5	Enhanced COMSEC function					
		g			D	
		i			D	
20.3.6	Enhanced DMSP/HRPT projection processing					
		c			D	
20.3.7	Enhanced data storage.					
		b			D	
		c			D	
		e	I			
		f	I			
		g	I			
		h	I			
		j			D	
		l			D	
		n			D	
		p			D	
		r	I			
20.3.8	Enhanced orbital pass scheduling					
		n			D	
		o			D	
20.3.9	Enhanced application of analysis tools to data items				D	
20.3.10	Enhanced softcopy display device.					
		c	I			
20.3.11	Enhanced exchangeable media.					
		a	I			
		b	I			
20.3.12	Enhanced state changes.					
		a				T
		b				T
20.3.13	Enhanced external interface with spacecraft systems					
	(DMSP	b			D	
	(HRPT)	a			D	
	(HRPT)	b			D	
20.3.14	Enhanced size properties.					
		e	I			
20.3.15	Enhanced weight properties.					
		b	I			
20.3.16	Enhanced interchangeability.					
		c	I			
20.3.17	Enhanced system GFE usage					
		a	I			

5 PREPARATION FOR DELIVERY.

5.1 Equipment preparation. The system shall be prepared for delivery in accordance with the contract statement of work.

5.2 Site preparation. This section is not applicable to this specification.

6. NOTES.

6.1 **Intended use.** This system provides tactical weather support to the Army and Air Force.

6.1.1 Missions. (See 3.1.4.3)

6.1.2 Threat. (See 3.1.4.4)

6.2 **Ordering data.** This section is not applicable to this specification.

6.3 **Definitions.**

6.3.1 **General definitions.**

Animation: Generation of apparent motion of an image by display, at rapid intervals, of successive views of the same image, taken at equal intervals of time. Ordinarily, 4 to 20 images are used in an animation sequence, which "loops" back to the first image after the last in the sequence is displayed.

Area of Operations: A square, centered on the STT location, with size determined by the minimum elevation selected for satellite ingest, but not to exceed 3300 nmi x 3300 nmi.

Automated Weather Distribution (AWDS): The weather system that interfaces to the Satellite Data Handling System at AFGWC to receive automatically generated, CIDE-formatted weather products, for distribution to other customers.

Brightness Temperature: Direct indication of brightness of an infrared reflection from clouds. Related to the atmospheric temperature in degrees K, with brighter image corresponding to colder temperature.

Critical Failure: Failure of the system (hardware or software induced) or combination of failures that would prevent the system from automatically receiving, processing, storing, and displaying visible and IR cloud cover imagery for two consecutive hours.

D-Matrix: Coefficients. expressed in matrix form, used to convert raw data from microwave imager and temperature/humidity sounder sensors to environmental data such as rain, cloud water, or surface wind.

Data.: Information of any kind, regardless of source, used in the generation of a weather chart, weather map or other means of conveying the state of current or forecast weather. Data, for purposes of discussion here, are of two kinds, Satellite Weather Data and Conventional Weather Data.

Data Type: Meteorological satellite imagery designator, denoting infrared or visible sensor mode and relative sensor resolution, e.g., thermal smooth (TS), light fine (LF), local area coverage (LAC).

Deployed State: When the STT is operational, and able to receive DMSP data, receive APT/HRPT data, receive WEFAX data, and analyze and display data.

Disassembled State: When the STT is not operational, and is packaged into transit cases.

Earth Location: The association of each point on a weather image, graph or product with its corresponding position on the Earth's surface. The repositioning of the data points to correspond to standard map projections, i.e., Mercator Projection and Polar Stereographic Projection.

Environmental Data Record: Data record produced when an algorithm is used to convert Sensor Data Records (SDRs) to geophysical parameters. These parameters are normally of direct utility to a meteorologist/oceanographer or may serve as an input to a numerical model.

Ephemeris: Data relating to the orbital path of a satellite, used in predicting the future orbits of the satellite.

Failure: The cessation of any function crucial to mission performance.

False-Color: The artificial coloration of a monochrome image displayed on a color video workstation by independently varying the image input to each color channel in the workstation full-color imaging device.

Geostrophic Wind: Wind that is directed along the contour lines (isopleths) of a constant pressure surface.

Gridded Data Field (Uniform Gridded Data Field): Product data generated from conventional gridded field data. where the grid is an array of points used to represent locations on the surface of the earth. Spacing of the points is referenced to a distance of 381 km, at 60° North and 60° South of the equator. A grid with this spacing is known as a Whole Mesh Grid. For further details, consult Map Projections and Grid Systems for Meteorological Satellites" (James E. Hoke, et. al.), USAF Air Weather Service (MAC), Air Force Global Weather Central, Offutt AFB, Nebraska 68113. March 1981.

Hardcopy: Information presented in a permanent form on a film or paper medium. Also, the device used to generate the display.

Isopleths: Lines of equal pressure or temperature or other measured atmospheric parameter.

Lapse Rate: The decrease in temperature of the air with increasing altitude.

Link Margin: Number of decibels (dB) by which received signal strength of the RF link exceeds a specified value.

Mercator Projection: A conformal projection on which the meridians of longitude and parallels of latitude are shown as parallel straight lines at right angles to one another, the divisions of latitude being expanded north and south of the Equator in the same proportion as the divisions of longitude have been lengthened by projections. Shapes are preserved, and directions and paths of lines of constant bearing are preserved.

Mission Sensors: Mission sensors are specialized devices operating at wavelengths other than visible or far infrared. They provide humidity, temperature, rainfall and other data at the surface and through multiple layers of the atmosphere.

Non-Projected Image: An image from a sensor-based frame of reference.

Operator: The operator is a forecaster or other weather personnel associated with the USAF Air Weather Service. The operator will interact closely with the Small Tactical Terminal to accomplish quality control of all environmental data bases, create specific weather products, and coordinate all terminal-related AWS METSAT support requirements. The operator will obtain current information about available satellite transmissions and generate a schedule for acquisition of satellite data. Tasks include entering satellite ephemeris, evaluating tracking and earth location accuracy, updating operational software and controlling communication of the STT to outside destinations.

Overlay: A graphic or alphanumeric display, in a single, user selectable color, which may be superimposed upon an existing display.

Pass Completion: The end of data reception from a satellite.

Polar Projection: One in which the longitude lines appear as straight lines radiating out from the pole. The parallels of latitude arc concentric circles surrounding the pole .

Potential Temperature: The temperature that a fixed volume of air would acquire if it is moved adiabatically to a reference atmosphere, usually the sea-level reference of 1000 millibars.

Precipitable Water: The amount of liquid water that can be forced by precipitation from a given volume of atmosphere at a given pressure and temperature.

Product: Any display of weather information destined for use apart from the immediate task of generating weather forecasts. The product may be in the form of weather images, charts or alphanumeric text, presented on either softcopy or hardcopy.

Projection: The representation of the surface of the earth or an image surface or image plane. In some cases this representation can be generated geometrically using straight lines radiating from a point on or within the earth's surface to project the earth's surface onto a geometric figure, for example, Mercator Projection, Polar Stereographic Projection.

Pseudo-Color: The assignment of different colors to specific gray scale values of a monochrome image.

Satellite Weather Data: Weather data, whether directly received from a weather satellite or transmitted over some communications link, which originated from a weather satellite.

Sensor(Remote Sensor): A device, usually mounted on a satellite, for determining environmental parameters of the earth and atmosphere by means of receiving and processing electromagnetic radiation at very specific wavelengths. Sensors are classified into two groups: Imagers of visible and infrared radiation and Mission Sensors.

Sensor Data Records (SDRs): Instrument data at full resolution, time referenced, annotated with ancillary information including radiometric and geometric calibration coefficients, and geo referencing parameters such as platform ephemeris. These data are processed to sensor units (e.g., brightness temperature and radiance).

Softcopy: Information presented in a non-permanent form, such as on a video workstation display. Also, the device used to generate the display.

Sounding: In meteorology, an upper-air observation; a radiosonde observation.

SSM/I: A seven channel microwave radiometer with a conical scan pattern. It rotates at approximately 31.6 rpm. The seven channels are 19 GHz (vertical and horizontal polarization), 22 GHz (vertical only), 37 GHz (vertical and horizontal) and 85 GHz (vertical and horizontal). For the 85 GHz channels, 128 scene stations are observed at the scan frequency, while at the lower frequencies, 64 scene stations are measured at 1/2 the scan frequency.

SSMIS: Special Sensor Microwave Imager Sounder. A sensor combination designed to duplicate the capabilities of SSM/I, SSM/T-I and SSM/T-2 in a smaller, more capable and more reliable package.

SSM/T-1: A seven channel radiometer operating in the 50 to 60 GHz range. It scans in a cross track mode, making seven observations across the scan in approximately 32 seconds.

SSM/T-2: A scanning radiometer with one channel at 91.5 GHz, one channel at 150 GHz and three near 183 GHz. It scans cross-track making observations at 28 separate scene stations across the scan in 8 seconds.

Standard (Regular) Gridded Base: A meteorological numerical data base whose data values are restricted to the gridpoints of a standard (regular) mesh. See Gridded Data Field.

Standard (Regular) Mesh: A means of defining locations of weather data points of specific separations, on either polar stereographic or Mercator projections, used in numerical weather forecasting. For further details, See AFGWC/TN-79/003 "Map Projections and Grid Systems for Meteorological Applications" (Dr. J. E. Hoke, et. al.) USAF AWS/AFGWC. March 1981.

Stratosphere: The upper atmosphere. extending upward from the tropopause, where the general properties of the atmosphere are stable and stratified--horizontally distributed.

Terminal.: A mobile or portable weather analysis system used in tactical applications.

Thermodynamic Diagram.: Any chart or graph representing values of pressure, density, temperature, water vapor, or functions thereof, such that the equation of state, the Clapeyron-Clausius equation, and the first law of thermodynamics for adiabatic end saturation or pseudo-adiabatic processes are satisfied.

Tropopause: The boundary between the upper troposphere and the lower stratosphere that varies in altitude from 5 miles at the poles to 11 miles at the equator.

Troposphere: The lower two-thirds of the atmosphere, in which most weather (cloud and precipitation) occurs, extending from the surface to the tropopause.

Workstation: A device or devices, usually consisting of a video display, its supporting processor(s) and memory, a human interactive device(s) such as keyboard and graphic input device, and communications interface to other systems at distant locations .

6.3.2 Tool Definitions

6.3.2.1 Meteorological Tools

Contouring: This tool provides for the computation and display of smoothed and non-smoothed isopleths of any non-coded fields, for which monotonic numerical values exist, given the field type.

Wind Barb: A graphical representation of wind speed and direction at a point and pressure level. The graphic is made up of a shaft which points in the direction from which the wind is blowing and a series of barbs and pennants which represent wind speed to the nearest five knots.

ASCII Text File: This tool provides a readable display of alphanumeric values for a specified EDR field.

Streamlines: Lines which at any given instant are tangent to the wind velocity vectors at the points through which the lines pass.

Update Data: This tool, as referenced in Tables 3.2.1.3.5-1 and 3.2.1.3.5-2, provides a means of changing coefficients used in the SSM/I Environmental Data Record algorithms, and for modifying the D matrices, if used, for SSM/T-1 and SSM/T-2 EDR calculations.

Thresholding: This tool creates a new output data set by selecting data that are above, below, within, or outside of the specified values.

Units Conversion: The changing of one measurement unit into another of equal value including the following:

Conversions relating to Contouring tool:
Snow depth (inches, centimeters)
Wind speed (knots, mph, km/hr, m/s)
Temperature in degrees (K, C, F)
Dew point in degrees (K, C, F)
Pressure (inches of mercury, millibars)
Rainfall (inches, mm, cm)
Rain rate (in/hr, mm/hr, cm/hr)

Conversion relating to Distance Between Points tool:
Horizontal distance (nmi, miles, km)

Conversion relating to Contouring and Skew-T / Log-P tools:
Vertical distance (feet, meters, km)

Annotate/Draw with Meteorological Symbols: This tool allows the operator to draw symbolic lines and to place standard meteorological symbols on various displays to create products.

Skew-T/Log-P: The thermodynamic diagram with temperature as the abscissa and pressure as the ordinate. The temperature is on a linear scale but rotated somewhat less than 45 degrees clockwise. Pressure is on a logarithmic scale, decreasing upward.

Edit Skew-T/Log-P: This tool allows the operator the option of deleting or adding a level or changing the values of pressure, temperature, dew point temperature, wind speed, or wind direction at a given level. After the operator is satisfied with the sounding, the analysis is recalculated and displayed.

Quick EDR: An interactive algorithm library with help windows and automatic enabling allowing easy and quick EDR development, testing and field use.

6.3.2.2 General Purpose Tools

Text Editor: This tool provides for the creation and modification of ASCII files.

Orbital Trajectory: This tool calculates the orbital swath for RDS, RTD, SSM/I, SSM/T-1, SSM/T-2, HRPT, AMSU-A (P^3I capability), AMSU-B (P^3I capability), and APT in an earth locatable format for overlay onto a map background.

6.3.2.3 Image Analysis and Display Tools

Map Background: This tool provides for overlaying map backgrounds onto any displayed image or graphic. Applicable map backgrounds include land-sea boundaries, lakes and rivers, and geopolitical boundaries to the state or province level, as applicable.

Overlay: This tool allows a digital file to be superimposed upon another digital file of the same scale. This file can be in the form of a graphic or alphanumeric display in a single, user selectable color.

Cursor Position: This tool positions the cursor at an operator-specified latitude and longitude on any earth locatable display.

Cursor Interrogation: This tool displays the latitude and longitude, based on cursor position.

Distance Between Points: This tool measures great circle distances between any point and the cursor.

Histogram Equalization: A histogram of an image is a graph showing the number of occurrences of each gray level. It allows the thresholding of a single intensity variable. Using this information enables the operator to decide whether or not the use of a particular enhancement will increase the meaningfulness of an image. Histogram equalization is a tool that makes a histogram of the occurrence of the values for an input area. The output area is an enhancement of the input area where the range of digital values is proportional to the occurrence of the histogram values, i.e., if there are many digital values in a small brightness range on the area input, they are stretched to a wider range of brightness in the enhanced output.

False Color: A software implementation in which redundant information between channels is eliminated, reducing the dynamic range from 24 bits to 8 bits . Three channels (two 3-bit images and one 2-bit image) are individually assigned a shaded blue, shaded green, and shaded red color table.

Animation: Generation of apparent motion of image or graphic data by displaying the data in rapid succession from evenly spaced intervals of time over the same geographic area. Images or graphics are sequentially loaded into display frames. The display controller displays the frame sequence, frame by frame, until the user interrupts it. Ordinarily, four or more images are used in an animation sequence which, in a forward sequence, "loops" back to the first image after the last in the sequence is displayed.

Raster Imaging: A raster display device stores display primitives such as lines and characters (e.g., isopleths) and solidly shaded or patterned areas (e.g., satellite images). in a refresh buffer in terms of their component pixels. This type of device is based on television technology and consists of a display controller (may be hardware or software), a host computer interface, a refresh buffer (RAM in the display controller hardware or in the host computer), and a video controller interfaced to a TV-type monitor. A complete display on a raster monitor is formed from the raster, which is a set of horizontal raster lines, each a row of individual pixels; the raster is thus stored as a matrix of pixels representing the entire screen area. The entire image is scanned out sequentially by the video controller, one raster line at a time from top to bottom and then back to the top. At each pixel, the beam's intensity is set to reflect the pixel's intensity; in color systems, three beams are controlled - one each for the red, green and blue primary colors - as specified by the three color components of each pixel's value. The refresh rate is generally 60 Hz or higher to avoid flickering of the image.

EDR to Meteorological Display: A spatial depiction of a basic weather element (EDRs in the STT) displayed in an appropriate temporal and spatial resolution for each element. The interface allows the immediate display of the most recent versions of the

weather element. For example, Total Precipitable Water Fields could be displayed as discrete graphical areas shaded to represent various levels of precipitation. Another example would be individual overlays of 500 mb height contours, temperatures, dew points, and wind barbs.

Zoom: (1)Zoom In: To magnify (scale up) an image or graphic (pixel bitmap) by enlarging a section of the frame buffer and filling the entire view surface (display) with the enlarged section. (2)Zoom Out: To demagnify (scale down) an image or graphic in the reverse operation of Zoom In. The scaling needed to transform the user-selected section can be accomplished by repeating pixel values within the section as the image is displayed or retrieving additional pixels from display memory if the image stored has a higher resolution than does the display. Generally, a graphical input device is used to choose a center point and magnification ratio for the section to be zoomed.

Pan: To move the view surface (display) over a zoomed image or graphic. The graphical input device is used as the "handle" for moving around on the image.

Scroll: To move text or other information up and down within a view surface (e.g., a text window).

Toggle: Alternately displaying one of two images or graphics loaded in the frame buffer. When one is turned off it disappears from view but is still available in display memory for instant recall. A single mouse or keyboard button is generally used as the trigger for flipping between the images and/or graphics. This function is useful when analyzing two related data sets.

Create Modify and Apply Look-Up (Enhancement) Tables: Displayed images consist of pixels. The value of each pixel corresponds to the light or thermal intensity value as measured by satellite imaging sensors. For the purposes of gray-shade or color display, these values are mapped to a look-up table (LUT). The LUT determines the color or gray-shade of each pixel as it is displayed. Direct manipulation of these values "enhances" the image to highlight specific features. When creating and modifying these LUTs or enhancements, a range of values present in the target image is used to determine the colors or grayshade values assigned. A histogram is generally used to find this range of values. The LUT values, once set, are stored and recalled for similar images that require enhancement to bring out certain features.

Change Projection: The transformation of points in a coordinate system of dimension n into points in a coordinate system of a dimension less than n. In the STT, transforming a data set from a set of points with no perspective (other than grids or satellite projection) to a geographical perspective in the form of either Mercator or Polar Stereographic.

High Pass / Low Pass Filters: These tools are arithmetic/logic operations that are used for noise reduction and feature detection, for example. The idea behind filter operations is to let the value assigned to a pixel be a function of it and its neighbors. High pass filters attenuate the low frequency components without disturbing high frequency information in the Fourier transform. Similarly, low pass filters attenuate the high frequency components.

6.4 Abbreviations and acronyms.

AFGWC	Air Force Global Weather Central
AFR	Air Force Regulation
APT	Automatic Picture Transmission
ASCII	American Standard Code for Information Interchange
AVHRR	Advanced Very High Resolution Radiometer
AWDS	Automated Weather Distribution System
AWS	Air Weather Service
BIT	Built-in Test
BITE	Built-in-Test-Equipment
C	Centigrade (Celsius)
CCI	Cryptological Controlled Item
CDRL	Contract Data Requirements List
CFE	Contractor-Furnished Equipment
CI	Configuration item
COMSEC	Communications Security
CSCI	Computer Software Configuration Item (CSCI)
CWS	Combat Weather System
dB	Decibels
DMDM	Direct Mode Data Message
DMSP	Defense Meteorological Satellite Program
DoD	Department of Defense
EDR	Environmental Data Record
F	Fahrenheit
FED-STD	Federal Standard
FNOC	Fleet Numerical Oceanography Center
FQT	Formal Qualification Testing
GFE	Government Furnished Equipment
GKS	Graphical Kernel System
GMS	Geostationary Meteorological Satellite (Japan)
GOES	Geostationary Operational Environmental Satellite (U.S.)
GOES-NEXT	The next generation of GOES satellites
GPS	Global Positioning System
HRPT	High Resolution Picture Transmission
HWCI	Hardware Configuration Item
Hz	Hertz (cycles per second)
ILS	Integrated Logistics Support
IMETS	Integrated Meteorological System
IOT&E	Initial Operating Test and Evaluation
IR	Infrared
K	Degrees Kelvin
LAC	Local Area coverage
LRU	Line replaceable unit
LSA	Logistic support Analysis
Mbytes	Megabytes
METEOR	Russian Polar Orbiting Weather Satellite
METEOSAT	European Space Agency's Geostationary Weather Satellite
METSAT	Meteorological Satellite
MTTR	Mean Time to Repair
MHz	Megahertz

MTBCF	Mean Time Between Critical Failure
MTBF	Mean Time Between Failure
NDI	Non-Developmental Item
NOAA	National Oceanographic and Atmospheric Administration (US Department of Commerce)
NORAD	North American Air Defense
NSA	National Security Agency
ODD	Operational Design and Demonstration
OLS	Operational Linescan System
OT & E	Operational Test & Evaluation
P^3I	Pre-Planned Product Improvements
POSIX	Portable Operating System Interface
RAM	Random Access Memory
RDS	Real Time Data Smooth
RTD	Real Time Data
SCG	Security Classification Guide
SCN	Specification Change Notice
SCSI	Small Computer Standard Interface
SDR	Sensor Data Record
SGP	Simplified General Perturbations
SQL	Standard Query Language
SSM/I	Special Sensor, Microwave/Imager (DMSP Sensor System)
SSMIS	Special Sensor Microwave Imager Sounder
SSM/T-I	Special Sensor, Microwave/Temperature Sounder (DMSP Sensor System)
SSM/T-2	Special Sensor, Microwave/Vapor Sounder (DMSP Sensor System)
STT	Small Tactical Terminal
TACTERM	Tactical Terminal
TAF	Tactical Air Force
TAWDS	Transportable Automated Weather Distribution System
TBD	To Be Determined
TBS	To Be Specified
TCP/IP	Transmission Control Protocol/Internet Protocol
TIROS	Television/Infrared Orbital Satellite
TRD	Technical Requirements Document
ULOSA	Unit Level Open System Architecture
USA	United States of America
USAF	United States Air Force
VCRM	Verification Cross Reference Matrix
VGA	Vector Graphics Adapter
VHF	Very High Frequency
WBS	Work Breakdown Structure
WEFAX	Weather Facsimile

6.5 Guidance Documents. The following document may be used as a guide:

TRD-DMSP-3033 Technical Requirements Document for the Small
13 October 1993 Tactical Terminal (STT)

10.0 INCREASING THE ANTENNA SEPARATION.

This appendix defines the approach and assumptions for widening the separation between the antenna equipment and the processing equipment from 30.5 meters to 457 meters.

10.1 Approach.

The option to widen the separation between the processing equipment and the antenna equipment to 457 meters is intended for systems that will be deployed for long durations. As such, the additional resources necessary to widen the separation are considered separate from resources associated with either the basic configuration or the enhanced configuration.

10.2 Assumptions.

The system will support the option to increase the separation between the processing equipment and the antenna equipment to 457 meters with the following assumptions:

a. Any additional cabling, either for power or for signal, shall be considered additional equipment that is not part of either the basic or enhanced configurations and as such are not included in the determination of the weight and size properties specified herein.

b. Any additional power required to support the option will be supplied by the Government.

20.0 ENHANCED SYSTEM SPECIFIC REQUIREMENTS.

20.1 Scope.

20.1.1 **System overview.** The enhanced configuration of this system, in addition to providing the capabilities of the basic configuration, ingests, processes, stores, and displays Real-Time Data (RTD) from the DMSP satellites and High Resolution Picture Transmission (HRPT) data from the NOAA polar orbiting satellites.

20.1.2 **Section overview.** This section sets forth the performance, design, development, construction, and test requirements of the enhanced configuration of the system. The enhanced configuration is an upgraded version of the basic configuration, and as such the majority of the basic configuration requirements also apply to the enhanced configuration. This section therefore defines the requirements that are unique to the enhanced configuration and refers to Section 3 of this specification for the requirements that are common to the basic and enhanced configurations.

20.2. Applicable Documents.

The applicable documents of the exact issue are shown in paragraph 2 and the subparagraphs therein.

20.3. System Requirements.

The enhanced system shall be as specified in Section 3 and the subparagraphs therein with modifications presented herein.

20.3.1 Enhanced DMSP/HRPT data reception

Change 3.2.1.1.1.a to read as follows:

a. The system shall accept RDS and RTD data from DMSP Block 5D-2 satellites.

Change 3.2.1.1.1c to read as follows:

c. The system shall accept HRPT data from NOAA satellites.

Change 3.2.1.1.1d to read as follows:

d. The system shall be capable of NOAA HRPT reception on the following frequencies:

1) 1698.0 MHz
2) 1707.0 MHz

All signals have right hand circular polarization (RHCP).

20.3.2 Enhanced HRPT data processing.

Change 3.2.1.1.3 to read as follows:

a. The system shall process all five AVHRR channels in the HRPT data for earth curvature correction and perform all necessary calibrations.

b. The system shall earth locate NOAA AVHRR data in geodetic latitude and longitude.

c. The system shall generate non-projected images of the received NOAA AVHRR data. Non-projected images are the data received during the pass that have been earth curvature corrected and earth located.

20.3.3 Enhanced DMSP/HRPT quicklook.

Change 3.2.1.1.4a to read as follows:

a. The system shall provide a display of corrected non-projected imagery as the data is being received from the DMSP or NOAA satellite.

20.3.4 Enhanced DMSP/HRPT performance.

Change 3.2.1.1.5b to read as follows:

b. The system shall have a G/T no less than 4.5 dB/K for DMSP RTD, as measured by the solar flux method.

Change 3.2.1.1.5c to read as follows:

c. The system shall have a G/T of no less than 1.3 dB/K for NOAA HRPT, as measured by the solar flux method.

20.3.5 Enhanced COMSEC function.

Add the following to 3.2.1.2:

g. The system shall utilize a KG-44 decryption device for the RTD data stream.

h. Deleted.

i. The system shall bypass the RTD decryption device without operator intervention for selected satellites.

20.3.6 Enhanced DMSP/HRPT projection processing.

Change 3.2.1.3.1c to read as follows:

c. The system shall be capable of generating projected images of the received NOAA HRPT data in either Mercator or Polar Stereographic representation.

20.3.7 Enhanced data storage.

Change 3.2.1.3.3b to read as follows:

b. The system shall maintain the data items by the following data types:

1) DMSP data
2) APT data
3) WEFAX data
4) HRPT data

Change 3.2.1.3.3c to read as follows:

c. The system shall query the operator for confirmation and data archive options prior to purging data. To allow automated operations, this choice may be made at system startup.

Change 3.2.1.3.3e. through h. to read as follows:

e. The system shall provide storage for DMSP data allocated as follows:

1)	Projected and non-projected data	183	MBytes
2)	Sensor data records	44	MBytes
3)	Environmental data records	50	MBytes
4)	Text messages	.02	MBytes

f. The system shall provide storage for HRPT data allocated as follows:

1)	Projected and non-projected data	350	MBytes

g. The system shall provide storage for APT data allocated as follows:

1)	Projected and non-projected data	16	MBytes

h. The system shall provide storage for WEFAX data allocated as follows:

1)	WEFAX images	64	MBytes

Change 3.2.1.3.3j to read as follows:

j. The system shall, upon operator request, archive EDR data files and the associated meteorological displays to removable media.

Change 3.2.1.3.3l to read as follows:

l. The system shall, upon operator request, restore to main memory any EDR data files and the associated meteorological displays archived on removable media.

Change 3.2.1.3.3n to read as follows:

n. The system shall, upon operator request, archive any image or SDR or all images and SDRs on removable media.

Change 3.2.1.3.3p to read as follows:

p. The system shall, upon operator request, restore to main memory any image or SDR archived on removable media.

Change 3.2.1.3.3r to read as follows:

r. The system shall provide a nominal storage for user defined products, including automatically generated products, as follows:

1)	External formatted products	20	MB
2)	Internal formatted products	75.5	MB
3)	Enhancement tables	0.5	MB

20.3.8 Enhanced orbital pass scheduling.

Change 3.2.1.3.4.1n to read as follows:

n. The choice of RDS or RTD data shall be operator selectable.

Add the following to 3.2.1.3.4.1:

o. The choice of APT or HRPT data shall be operator selectable.

20.3.9 Enhanced application of analysis tools to data items.

Change Table 3.2.1.3.5-2, second row title, to read as follows:

NOAA APT/HRPT VIS & IR

20.3.10 Enhanced softcopy display device.

Change 3.2.1.3.7.1 to read as follows:

b. The softcopy display device shall have a resolution no less than 1024 x 768 pixels.

c. The minimum display viewing area for the softcopy display device shall be no less than 38.1 centimeters (15 inches) diagonally.

20.3.11 Enhanced exchangeable media.

Change 3.2.1.3.9 to read as follows:

3.2.1.3.9 Enhanced exchangeable media. The system includes an exchangeable media for the purpose of loading software and data onto the system and an archive device for the purpose of archiving meteorological products.

a. The system shall include a 3.5 inch floppy disk drive.

b. The system shall include an archive device.

20.3.12 Enhanced state changes.

Change 3.2.2.1 to read as follows:

a. The following transitions shall require no greater than one hour:

1) from the disassembled state to the deployed state. This excludes the time for temperature of the sheltered equipment to stabilize within the operational range.

2) from the deployed state to the disassembled state

b. The transition from the deployed state to the disassembled state shall require no greater than one hour for personnel wearing chemical suits.

20.3.13 Enhanced external interface with spacecraft systems.

Change 3.2.3.1.1b to read as follows:

b. The RDS and RTD data formats shall be in accordance with IS-YD-821C and specification 174573 (the Plans ICD).

Change 3.2.3.1.4 to read as follows:

3.2.3.1.4 HRPT data interface. The system interfaces to the NOAA TIROS-N spacecraft for the receipt of HRPT data.

a. The interface to the NOAA TIROS-N spacecraft shall be in accordance with IS-2285557.

b. The HRPT data format shall be in accordance with IS-2285557.

20.3.14 Enhanced size properties.

Change 3.2.4.2.1.e to read as follows:

e. The disassembled system shall consist of no greater than 16 transit cases.

20.3.15 Enhanced weight properties.

Change 3.2.4.2.2 to read as follows:

b. The total weight of the system shall be less than or equal to 545 kilograms (1200 pounds).

20.3.16 Enhanced interchangeability.

Add the following to 3.3.5:

c. The enhancement kit for the system shall consist of the modular hardware and software components required, in addition to the basic system, to meet the enhanced capabilities identified within this document.

20.3.17 Enhanced system GFE usage.

Add the following to 3.3.10a:

1) KG-44 decryption unit